PHILIPPINE
BUREAU
OF
SCIENCE

REPORTS
5-11
1906-12

Q
183
.P55

UNIV.
OF
MICH.

NINTH ANNUAL REPORT

OF THE DIRECTOR OF

THE BUREAU OF SCIENCE

TO THE HONORABLE
THE SECRETARY OF THE INTERIOR

BY

PAUL C. FREER
DIRECTOR OF THE BUREAU OF SCIENCE

FOR THE YEAR ENDING AUGUST 1, 1910

MANILA
BUREAU OF PRINTING
1911

99924

NINTH ANNUAL REPORT OF THE DIRECTOR OF THE BUREAU OF SCIENCE.

DEPARTMENT OF THE INTERIOR,
BUREAU OF SCIENCE,
Manila, August 1, 1910.

SIR: The following report gives an account of the work performed in the Bureau of Science for the period from August 1, 1909, to August 1, 1910, together with such recommendations regarding future improvements as seem to me to be necessary.

The Bureau of Science has been in practical existence since the latter part of 1901, the organization at first consisting of a chemical and biological laboratory. It was located in a rented house back of the present Civil Hospital and there were six employees. Entomological investigation began on December 9, 1902, and with it the foundations of the present entomological collection. On January 1, 1903, the serum laboratory and the grounds at San Lazaro were transferred to the Bureau from the Board of Health. The section of botany, which had been organized in the Bureau of Agriculture, and the nucleus of the herbarium were added on July 1, 1903. On November 1, 1905, the Bureau of Mines ceased to exist and became the division of mines of the Bureau of Science, and on November 1, 1906, the same course was pursued with the Bureau of Ethnology, which before that time had been incorporated with the Bureau of Education. The present laboratory building of the Bureau of Science was occupied early in the year 1905 and at that time the work was enlarged by the appointment of an engineering force and the operation of steam and electric machinery. The purchase of books for the library began soon after the organization of the Bureau, and this adjunct of the scientific work grew rapidly, necessitating the gradual enlargement of the force and the organization of the library staff. Important work made necessary by the needs of the Islands was from time to time added to the existing divisions. A cement-testing laboratory and a laboratory for the examination of foods and drugs were developed within the division of chemistry. The serum laboratory, which at first had undertaken only the preparation of vaccine virus and a small quantity of antirinderpest serum, increased its scope so as to cover all sera and prophylactics used by the Civil Government, so that horses were added to the herd of cattle and calves. The biological laboratory, which had always been connected closely with the

Civil Hospital and had done the general scientific work for the Board of Health, undertook the diagnostic determinations for Bilibid Prison, for the San Lazaro Hospitals for contagious diseases, and, at a later date, a fair share of the teaching and hospital work belonging to the Medical School. Investigations in the provinces, bringing with them a more extended study of helminthologic infections also eventually became necessary in order to give a clear understanding of the general condition of the people. Members of the staff are also in periodic demand by the Bureau of Health in conjunction with the collecting of lepers for the Culion Colony. Within the past year, the division of mines and the chemical laboratory have begun the testing of road materials, and the chemical laboratory, that of concrete, sand, and gravel used in structural operations. Since its transfer to the Bureau of Science, the division of ethnology has undertaken the preliminary organization of the Philippine Museum and has secured sufficient material to fill three-quarters of the space in the building assigned to it on Calle Anloague, one-quarter being reserved for the exhibit of the Bureau of Forestry.

There was one transfer from the Bureau of Science, namely, that of the serum herd to the Bureau of Agriculture on January 2, 1907. A portion of the expense of this herd had been borne by the congressional relief fund, but in 1906 and 1907 the costs were included in the general appropriation.

The appropriations made by the Government for the Bureau of Science were steadily increased during the first five years, being ₱99,765.64 for 1903, the first complete year of the existence of the Bureau, and ₱325,000 in 1907, the year in which the serum herd was transferred to the Bureau of Agriculture, one-half of the expenses of the herd belonging in the appropriation for this Bureau for the fiscal year 1907. In 1905, the last year in which the Bureaus of Mines and of Ethnology were in existence as such, the total appropriations for the Bureau of Science, the Bureau of Mines, and the Bureau of Ethnology amounted to ₱334,893.86. In 1908 the appropriation for the Bureau of Science, which then included the division of ethnology and the division of mines, was ₱307,700, a total sum considerably less than that previously assigned to the three Bureaus. This amount was not materially increased until 1910, when the Assembly established a sugar-testing laboratory at Iloilo and appropriated funds both for it and for the purchase of museum specimens, the total sum for that year being ₱327,000. For 1911 the appropriation was further increased to ₱340,000, the addition being chiefly based upon the greater cost to the Bureau of printing and binding.

Expenditures for the library have been made during the entire period of approximately nine years. The total outlay for books at the present time is ₱93,897.89. The original plan contemplated an expenditure of ₱90,000 spread over a period of six years, so that in nine years the total has exceeded the sum planned to cover six years by only ₱3,897.89, and this despite the fact that the institution, since 1905, is the scientific library of the entire Government.

The steady growth of the Bureau in the past and the regular addition each year of new lines of work make it certain that the years to come will show similar conditions. The testing of building materials can not stop with that of cement alone; it must include the very important adjuncts of gravel, sand, and concrete, and in order adequately to provide for such work additional machinery, quarters, and probably additional employees will be needed. The division of mines, owing to the expansion of the mining industry, must undertake the experimental testing of ores and this also will require additional machinery, space, and, in time, men. The machinery for the examination of road materials and for the development of this line of investigation must also be taken care of. Very little has been done on the native foods, the work heretofore having been largely confined to importations through the customhouse. The development of the sugar interests of the Archipelago and the great possibility of the alcohol industry demand attention from a scientific standpoint. Tan barks, essential oils, paper, and other natural products require study. The biological laboratory should give a larger proportion of its time to the scientific study of animal diseases, and the library should develop in many directions which heretofore have been covered by a few standard books only. This is especially necessary in the direction of completing the journals and sets relating to general biology. While we have many of the works we need in ornithology and in botany, and are quite well equipped in entomology, we are sadly lacking in the literature of protozoölogy, marine biology and in many other directions. While not having any greater funds at the disposal of the library than were originally contemplated and while the bills for binding and for subscriptions have annually become larger, owing to the expansion of the general scientific work and to the fact that the library now represents all scientific departments in the Government, the funds for the purchase of books have by no means increased in the same proportion.

The expansion of the Bureau has also brought with it the necessity of a greater expenditure for clerical work. Another item of increase has been the rapid development of the photographic collection. This now includes some 10,000 negatives, which necessitate a complete and elaborate catalogue and filing system, this work being undertaken by the library staff.

The income of the Bureau, outside of its annual appropriations, is derived from inter-Bureau vouchers and from cash receipts. As, however, the inter-Bureau vouchers represent but little more than cost and depreciation, they are covered by legitimate demands upon certain divisions; although in some instance, as in the case of the filtering and bottling of rinderpest serum, were that work to cease, a certain staff in the division would still be necessary to prepare other sera and prophylactics. This income, therefore, does not represent a great increase in the resources available for general undertakings. A large proportion of the work of the Bureau, such as that represented by diagnoses, chemical analyses, surveys by the division of mines, botanical work, work on entomologic and ethnologic investigations of all kinds, consultations with and advice to members of the public and to other Bureaus, the use of the library, the formation and care of the various collections, the classification of specimens, the opening to the public of the museum and many other things can not now, and never will be, sources of income; so that the greater proportion of the expense of the Bureau and of its expansion must be borne by appropriation.

The Bureau of Science performs scientific work for all parts of the Government, they are all benefitted thereby, and the greater proportion of the results obtained has a permanent value which may not be apparent immediately, but which is potential. The results of many of the investigations, although available at present, may not be utilized from a commercial, hygienic, or educational standpoint until a much later date. An example of this may be found in our investigations on the subject of the materials available for paper making. While no pulp factory has as yet been established in the Islands, the attention of the world has been called to the profits to be derived from such an undertaking, and as the price of wood pulp increases, a time will come when the publications of this Bureau on that subject will be utilized and when a large industry will be established. The herbarium, the entomologic collection, the collection of the division of ethnology and that of the division of mines have all been utilized to the greatest extent by the various divisions of the Government, and when the university establishes its courses of instruction these collections will also become fundamental to that institution. The future great expense of bringing together this material will thus be avoided. Our cholera prophylactic may not at present have an extended use, but with the gradual recognition throughout the world of the great advantages derived from vaccination against typhoid fever, the time will come when a similar method will be the main reliance in preventing the spread of cholera. The work of a bureau like the Bureau of Science, therefore, is such that many of its benefits are for the future. The publications giving the results which have been obtained are in such permanent form and are available in so many places that the accomplishments of the Bureau of Science can not be lost.

It is safe to assume that if we take the sum total of the general appropriation for the Government and of the moneys appropriated in the provinces and municipalities, the total expense for scientific work, including the cost of the general scientific library, is not 1 per cent of the total revenues. It will be seen from the above that the appropriation for the Bureau of Science has not been increased in the same degree that the demands made upon the Bureau have increased, nor to the extent that its rapid development would warrant. The Bureau must continue to develop as the country grows and as the desire for accurate study of many of the conditions which surround us is extended, and therefore it must steadily add new phases of work. However, such a development can not take place and such new phases can not be added in their greatest efficiency without funds to foster the expansion. It is hoped that the legislative body will see fit to increase the appropriation of the Bureau at least by a sufficient amount to take care adequately of the present items of growth which have been detailed above, and to allow of a fairly large purchase of new books and sets for the library.

The question of the salaries of scientific employees, of the loss to the Government entailed by the departure of those who have made themselves acquainted with Philippine conditions by a number of years of service, and the question of the increased demand for scientific workers and the increased salaries for positions occupied by them in the United States, has been emphasized in previous reports. Our employees, when they have acquired a knowledge of the demands of the Philippines and of the conditions obtaining in the Islands in addition to their fundamental training, should have a future to look forward to, and not, after they are married and have families to support, a certain fixed and not very great maximum beyond which they can not go. A system of pensions or a percentage increment of salaries after a certain number of years of service would do much toward insuring permanency in the staff. It is certainly true that the difficulty of securing trained employees at the salaries which we offer increases year by year, as the conditions in the United States change.

The present year will see the completion of the Medical School building, probably of the new wing of the Bureau of Science, and of the General Hospital. All of these edifices are on one campus which has not been systematically graded or filled, parts of the work having been done as necessity arose for each building. It would seem that an appropriation should be made now to take care of grading and filling the entire plot of land which includes these buildings, of adequately parking the whole and of planting and caring for trees, shrubs and grass.

The museum building on Calle Anloague has 54 meters frontage on the chief wholesale business street of the city, and the land, including the courtyard, has an area of 1,232 square meters. The building is in good condition; the ground floor is light, airy, and dry, and both of the floors are eminently fitted for good offices, although the lower floor perhaps might best be used for storage purposes. It seems to me that the Government should be able to secure a very good price for this property.

Undoubtedly, cash could not be obtained, but if a partial payment in cash were secured, the mortgage on the building could be transferred to the Postal Savings Bank. In any event from ₱80,000 to ₱100,000 might be obtained from this sale and utilized for a fund to begin the building of a new museum structure. A reinforced-concrete museum building 20 meters wide and 80 meters long would cost approximately ₱192,000, and it is estimated that ₱48,000 would be expended in the purchase of museum cases, shelving and fixtures and in the mounting of specimens and other work, making a total cost of ₱240,000 for a complete and adequate museum. If the building on Calle Anloague would bring only ₱80,000 the amount to be met ultimately by appropriation would be ₱160,000. A Philippine General Museum, including an information division, an exhibit of all the natural products of the Islands and accessible commercial data regarding each of these, would not only constitute one of the greatest attractions for visitors to the Islands, but would also be the place where investors desiring knowledge in regard to all matters in which they are interested, could find information quickly and accurately. Such a commercial information division would need to be organized with the coöperation of all Departments and Bureaus of the Government, so that its sources of information would be far-reaching and complete.

The desirability of an aquarium has been mentioned in previous annual reports. I am glad to say that steps have now been taken to insure the establishment of such an institution.

The work which has been accomplished in the Bureau during the past year is outlined in that part of the report covering the several divisions.

THE FAR EASTERN ASSOCIATION OF TROPICAL MEDICINE.

The first biennial meeting of the Far Eastern Association of Tropical Medicine was held in Manila between the dates of March 5th and 14th, 1910. There were present the following delegates: Dr. Francis Clark, Hongkong, China; Dr. John M. Atkinson, Hongkong, China; Capt. H. B. Neeb, Batavia, Java; Dr. J. DeHaan, Batavia, Java; Dr. Gorosaka Shibayama, Tokio, Japan; Dr. H. Campbell Highet, Bangkok, Siam; Dr. H. Fraser, Kuala Lumpur, Federated Malay States; Dr. Gilbert E. Brooke, Singapore, Straits Settlements; Doctor Staby, Tsingtau, China; Maj. A. Hooton, Bombay, India; Dr. Aldo Castellani, Colombo, Ceylon; Dr. Mary Fulton, Canton, China; Dr. Robert C. Beebe, Nanking, China; Dr. Otto Bartels, representing German New Guinea.

The sessions were held on the upper floor of the administration building of the new Philippine General Hospital. An extensive and instructive exhibit covering work in pathology, bacteriology, hygiene, Philippine foods and food values, medical zoölogy and therapeutics, was installed on the ground floor. The sessions were very well attended and the papers which were read touched upon a wide range of subjects and brought forward much interesting discussion. The Association decided to have its work, including the discussions, published in the Philippine Journal of Science, so that the first four numbers of the medical section of Volume V of that journal practically have been taken up by papers read at this meeting.[1] The general public assisted energetically in the organization of the local entertainments and in the reception of the foreign delegates, so that apart from the scientific work, the time of everybody was very fully occupied.

The first meeting of the Association demonstrated conclusively the great benefits which can be derived from organizations of this kind in the Orient. The scientific work in this part of the world is isolated to a greater extent, perhaps, than anywhere else. The tendency of all engaged in the development of medicine in the Orient is toward a relaxation of effort after a number of years of residence, chiefly because of the fact that contact with others in the scientific world and opportunity for mutual discussion which stimulates scientific endeavor, are lacking. The impetus to the work given by a congress of this kind is felt for a number of years. New questions arise, numerous lines of investigation are blocked out and new ideas as to the improvement of existing conditions are advanced, so that all actually concerned are materially benefited.

The next meeting of the association will be held in Hongkong. It will be easier to reach that colony than the Philippines and consequently it is hoped that even a larger attendance, especially of persons located along the China coast will result. In the end, the meetings should bring to those in other parts of the world a better understanding of Oriental conditions and an increased tendency to come to our centers for the purpose of study and research should follow.

The Association met in Baguio during the last three days of the session and therefore its foreign members became acquainted with the efforts of this Government to establish a capital in the mountains. All of the delegates expressed themselves as being greatly impressed with the results which so far have been accomplished, and the majority made elaborate reports to their own governments on the subject.

THE BIOLOGICAL LABORATORY.

Doctors Musgrave and Andrews, owing to the relationship between the Philippine Medical School and the Bureau of Science, had during the past year been devoting their entire time to the former institution, Doctor Musgrave as chief of clinics and professor of clinical medicine and Doctor Andrews as assistant professor of bacteriology and pathology. They were transferred on June 30 to the Philippine Medical School. This left two vacancies. Doctor Musgrave's position was filled by the promotion of Doctor Oscar Teague, and Doctor Andrew's place by Doctor Sellards. Dr. Ernest Linwood Walker, from the laboratory of comparative pathology of the Harvard Medical School, will come to the Bureau in August and will occupy the position formerly held by Doctor Teague. There will then remain three places which at present are not occupied: the one held by Doctor Coca who has returned to the United States; the second, by Doctor Ohno who has gone to Europe; and the third was vacated by Doctor Bowman through promotion. The place formerly held by Mr. Willyoung was divided as to salary on the last appropriation bill, so as to provide for two Filipino Government students who have completed their work in the United States. It is desirable to unite the authorized remuneration of the lesser positions now vacant in such a way as to allow us to bring out one more highly trained man. Any balance left would permit us to engage another young routine assistant. Such funds could also be used for returning Government students, or for graduates of the Philippine Medical School when they are available. In this connection, our constant lack of trained pathologists should be recalled, as well as the frequent emergencies necessitating the assignment of all available members of the staff to special duties.

---

[1] A list of these papers is given under the heading "Philippine Journal of Science."

Dr. A. F. Coca, whose work on the specific treatment of carcinoma was of fundamental importance, left the Bureau in order to continue his studies in the United States, where he could obtain more material, and Dr. Philip E. Garrison was ordered to return to duty in the United States. The place of the latter was filled by Dr. David G. Willets, formerly assistant to Dr. Charles Wardell Stiles and pathologist in the Georgia State sanatorium.

The biological laboratory during the past year has devoted more attention than formerly to the investigation of animal diseases. The studies of the previous eight and one-half years of its existence had covered such a wide range of diseases attacking human beings, that it seemed possible to give some time to those affecting animals.

INVESTIGATIONS.

Surra.—Surra or trypanosomiasis of horses and cattle has been prevalent in these Islands practically since American occupation. The laboratory continued the study of a possible cure of this disease by chemical preparations. This divided itself into two sections. First, the use of chemical remedies which were received through the courtesy of professor Paul Ehrlich of Frankfurt. Among these, arsenophenylglycin was found to be the most satisfactory of any of the remedies yet discovered. Monkeys infected with the trypanosoma of surra and which had received one-tenth of a gram of arsenophenylglycin per kilogram of body weight, or a greater amount, were negative for trypanosomata after twenty-four hours and the parasites did not reappear at any subsequent time. These animals could therefore be cured permanently of surra by a single injection of arsenophenylglycin. Extensive experiments were also performed with horses. During the year, an epidemic of surra occurred on the Government stock farm at Alabang and seventeen animals which developed the disease were treated. The work was not carried out under the most favorable conditions and it was necessary to abandon treatment in a number of cases because there was not enough arsenophenylglycin for all of the infected horses. In spite of this drawback, seven of the animals have been definitely and permanently cured of surra by the intravenous inoculation of arsenophenylglycin and therefore this method appears to be of some practical value in the treatment of surra, since the disease in horses is invariably fatal if they are not treated.

While it appears that we have been able to save a certain percentage of horses infected with surra we can never predict with certainty whether in a given instance we will be able to cure the animal, or whether he will succumb to the toxic action of the drug, which result probably is due largely to the arsenic which it contains.

The second line of experimentation was undertaken in conjunction with the chemical laboratory with the hope of obtaining a less toxic, synthetic substance. Doctor Karl J. Oechslin was detailed to the biological laboratory exclusively for the synthetic work. At present, certain derivatives of quinine are being prepared and their nature and action studied. The work on surra was carried on by Doctors Strong and Teague.

Hydrophobia.—Studies relating to hydrophobia have been continued in the laboratory. In the previous annual report reference was made to the work of Doctor Coca on this subject. Owing to the mildness of the infections which he encountered in the beginning, it seemed doubtful to him whether he was dealing with true hydrophobia, or with a new variety of the disease. Doctor Coca's departure for the United States interrupted his studies. Work in the laboratory was continued by Maj. E. R. Whitmore of the Medical Corps, United States Army, detailed for duty with the Bureau of Science. Dr. F. W. Dudley, formerly of the staff of the Philippine Medical School, gave his efforts, assisted by Doctor Whitmore, in obtaining material for examination, both from the provinces and from Manila. In April the Negri bodies were discovered in the brains of two dogs which had developed symptoms of rabies in Angeles, Pampanga Province. Rabbits were inoculated from these animals and a virus obtained. Doctor Whitmore undertook a journey to Saigon and was directed to bring back to Manila in animals the strain of fixed virus in use at the Saigon institute for the treatment of rabies. This has been accomplished and this strain is at present being kept alive in this laboratory.

Doctor Dudley, in 1907, reported that from a clinical standpoint in the Philippines he had seen hydrophobia in dogs and in man in thirteen undoubted cases, but owing apparently to the rarity of the disease in Manila, no definite case in which the Negri bodies were demonstrated was brought to the attention of this laboratory before April of the present year.[1] The Bureau of Science on several previous occasions, extending as far back as 1903, had taken the opportunity, while its employees were visiting Japan, to secure the fixed virus, but the organism in all of the preparations so secured was not resistant to the conditions in Manila. The Bureau also attempted to secure the fixed virus by direct shipment on ice from Japan, with the same result.

Carcinoma.—Important researches in the treatment of carcinoma were carried on during the year in conjunction with the surgical department of the Philippine Medical School. A vaccine against carcinoma was prepared by Dr. Arthur F. Coca of this laboratory and a series of investigations made by him and Dr. Philip K. Gilman, on the treatment of this disease in human beings. They came to the conclusion that the protoplasmic substances of malignant epithelial tumors in human beings can be injected subcutaneously in large quantities, apparently without injurious results. A preliminary report of the work was published in the last number of Volume IV., Section B., of the Philippine Journal of Science. A brief quotation of the summary of their publication is given: "In three cases affected with carcinoma, such injections have been followed by the softening and disappearance of tumor masses measuring in diameter from 2 to 4 centimeters. In a fourth case, a rapidly growing lump appeared near the site of the excised cancer two days after treatment. Several days later, when the lump had reached a diameter of 4 centimeters, the growth ceased and subsequent microscopic examination showed it to be a firmly encapsulated mass of dying epithelial-like cells. Three other surgically absolutely inoperable cases, in two of which visible amounts of cancer tissue were left unexcised, have remained until now, i. e., for from five weeks to six months, free from recurrence of the disease. Seven other cases have remained free from a return of the disease for from one to seven months. Two of these were designated as curable by operation; three were designated as probably curable by operation; and two were designated as of doubtful curability by operation. In only one case has the disease returned after treatment. In this case the material used for vaccination was rendered inert by too vigorous disinfection." Doctor Coca left for the United States in

---

[1] Doctor Ohno, on July 9, 1907, made a report to the Director of the Bureau on material from a dog suspected to have hydrophobia and submitted by Doctors Ashburn and Craig, U. S. Army, who examined smears from the hyppocampus and stated that they found bodies in contour like Negri's in these smears. Doctor Ohno inoculated three rabbits with the material, two of which died within twenty-two and twenty-four days, respectively, the third was in a dying condition on the thirty-first day.

February, 1910. Since his departure the treatment in such cases of carcinoma as have been available has been continued by Doctor Gilman, assisted by Doctor Bowman of the staff of this laboratory, Doctor Bowman preparing the vaccine according to Doctor Coca's method. The results have not been as favorable as were originally hoped for at least two of the cases have died of recurrence. The outcome of the other cases is being watched at the present time.

Leprosy.—Experiments with cultures of the acid fast organism isolated in cases of leprosy by Mr. Clegg have been continued. A vaccine has been prepared and fifty lepers treated by inoculation. So far, the results in the treatment of the disease with killed cultures or extracts of the organism have not been more successful than those obtained in general with killed tubercle bacilli in tuberculosis.

The treatment of leprosy with Nastin was also given a trial by Doctor Teague, who concluded that the method, which is based upon the use of this preparation, is not founded upon any of the established principles of immunity reactions, that it is not a vaccine therapy but a drug treatment, and that it is purely empirical. The Nastin treatment has not produced beneficial results in the cases of leprosy which have come under our hands in Manila. Studies were also performed by Doctor Teague with a view to ascertaining if the cutaneous reaction could be obtained in leprosy by the inoculation of extracts made from leprous nodules, and if such extracts could be used for diagnostic purposes. However, the results were all negative. Doctor Whitmore and Mr. Clegg also did some general work in the vaccine treatment of leprosy.

Cholera.—In continuing the study of cholera, analyses of the blood were made by Dr. Hans Aron, of the department of physiology of the Philippine Medical School, which analyses showed that a marked loss of salts and water actually occurs during certain stages of the disease. Experiments in monkeys were then performed in the biological laboratory with the idea of ascertaining, first, what symptoms were produced by the abstractions of large amounts of water from the blood through the intestines, following the use of large and repeated doses of purgatives; and, secondly, in how far the symptoms of Asiatic cholera were due to the loss of large amounts of water. While a condition of shock and even death was produced in some of the animals in which it was possible rapidly to cause the loss of a large amount of water through the administration of purgatives, nevertheless, all of the symptoms and the lesions of Asiatic cholera could not be produced in this manner. A great obstacle in the way of successfully carrying out these experiments is found in the fact that it is frequently very difficult to cause the loss of much water from the intestines by the use of purgatives, unless very large doses of the drug are given. The animal was then frequently seriously poisoned so that, for instance, large doses of magnesium sulphate administered by the stomach frequently caused shock and death.

Studies were also performed with the idea of ascertaining to what extent the symptoms of cholera are due to acid intoxication and from the results obtained so far it would appear that at least some of the lesions in the kidneys are directly related to this process. The virulence of the organism in the stools of "cholera carriers" was also investigated. It was found in several instances that individuals who have never suffered from cholera were carrying cholera spirilla in their intestines which were fully as virulent and as capable of producing infection in animals as those encountered in the fæces of many cases of severe cholera. However, these organisms only survive for a limited period in the fæces of "cholera carriers." The laboratory also endeavored to ascertain what effect, if any, certain species of protozoa grown in the esteros of Manila would exercise upon the virulence of the cholera organism when cultivated with them. It was found that the cholera vibrio was not increased in virulence by being cultivated with amœbæ from these sources. The cholera vibrios in unsterilized estero water quickly became overgrown and apparently disappeared, as the organism could not be reclaimed by cultivation after twenty-four hours.

Detailed experiments on the production of the cholera toxin were carried on. Filtrates of a large number of freshly isolated cholera spirilla, cultivated according to the suggestions of R. Kraus, were injected intravenously into rabbits, but in no case was a filtrate of high toxicity obtained. The presence of an endotoxin could be demonstrated. The work on this subject performed in this laboratory several years previously was thus confirmed, but that of Kraus could not be substantiated and no antitoxic serum of value for treatment was obtained. Attempts were made to grow cholera vibrios in symbiosis with a protein-splitting bacillus, under both aërobic and anaërobic conditions, but no soluble toxin could be detected in the cultures. Cholera vibrios were cultivated in media containing large amounts of coagulated serum and the whites of eggs. The proteins were to a certain extent dissolved by the ferment of the cholera spirillum, but no evidence of an increase in toxicity of the organism was shown.

Vibrios other than cholera.—A study was made of a large number of vibrios which were isolated from the intestines of individuals dying in Manila from diseases other than cholera, from the fæces of normal individuals and from water. Many of these organism gave the indol reaction and possessed motility as well as a morphology similar to that of the cholera vibrio. However, the majority could easily be separated from the true cholera spirillum by tests with cholera serum. Only one noncholera vibrio obtained from a case of amœbic dysentery showed a partial agglutination with an anticholera serum. This failed to give the indol reaction. Pfeiffer's reaction with the organism was doubtful because of its low virulence. These experiments demonstrate that for all practical purposes the serum reactions are satisfactory for detecting the cholera organism and for separating it from other, noncholera, vibrios.

The treatment of cholera.—The treatment of the disease by means of the subcutaneous injection by hypertonic saline solutions was given a trial, but the results obtained were not more favorable than when normal saline solutions were employed. In this connection the experiments of Doctor Aron in this laboratory and in the physiological laboratory of the Philippine Medical School are of considerable interest. Doctor Aron found that in the stage of collapse from cholera, a loss of water is regularly encountered in the blood, accompanied by a corresponding loss of chlorides (salts). This loss in water is consequently higher in persons who die of cholera than in those who recover. In the later stages of the disease when the patient has survived for a number of days, the blood again shows an almost normal content of water, but the salts are not replaced up to the normal figure; therefore at this time the blood has a diminished salt content and is hypotonic.

An advance in the treatment of the disease has apparently been accomplished in a somewhat different manner. From experiments performed by Doctor Sellards, a well-marked tolerance for sodium bicarbonate apparently exists in cholera patients. The bicarbonate solution was administered to the patients intravenously. In normal individuals the administration of from about two to five grams of bicarbonate is followed by a definite physiologic reaction, but cases of cholera frequently withstand as much as thirty and even eighty grams without any reaction. The administration of sodium bicarbonate in these large amounts in many instances produced a change in the course of the disease. Whereas the usual methods of treatment have no specific effect on the secretion of urine, the use of the bicarbonate was followed by a liberal secretion, with the result that in the cases treated, death from uræmia seemed to be eliminated and the general mortality also appeared to be lessened. Further work of this nature is still in progress.

Dr. Allan J. McLaughlin, of the Bureau of Health, collaborated with Doctor Sellards in inaugurating some work on the use of hypo- and hypertonic salt solutions in the treatment of cholera, and Doctor McLaughlin has undertaken an investigation in the biological laboratory on the morphology of the cholera spirillum, the results of which will be published in the Philippine Journal of Science.

Animal parasites.—Approximately 9,600 routine examinations of the fæces of the inmates of Bilibid Prison have been made during the year. These examinations have been valuable as a means of ridding the prisoners of the infesting organisms on admission to the institution. All prisoners arriving at Bilibid are placed in quarantine for five days. During this period their fæces are examined and those infected are sent to the prison hospital to be treated systematically (in those cases where treatment is effective) until no further evidence of infection exists. In addition, all patients admitted to the hospital during the year have been examined. Gradually, by these means the percentage of infection by animal parasites in the inmates is being reduced.

During the year a request was made by the Director of Health for the examination of the fæces of the inhabitants of Las Piñas and of the Cagayan Valley for the purpose of ascertaining particularly the percentage of hookworm disease and of parasitic infection among them. Doctor Gomez was first sent on this detail; subsequently he was replaced by Doctor Willets. Approximately 6,000 examinations were made in Las Piñas and 11.1 per cent of those examined were found to be infected with the hookworm, while 89 per cent harbored some form of intestinal parasite. Nearly 7,700 examinations were finished in the Cagayan Valley and approximately 38 per cent were positive for the hookworm, and 80 per cent for some form of intestinal parasite. The majority of the infections were very mild, one or two ova only usually being encountered in a microscopic preparation. In Baguio, 100 Igorot children were examined for intestinal parasites by Doctor Bowman; 32 per cent were infested with hookworms. All of the infections were mild and no symptoms of disease were observed in any of the children. The total percentage harboring some form of intestinal parasite was 56. *Tænia canina* was found in several dogs which were killed in Baguio, but no case of human infection was encountered, although the Igorots live in close contact with dogs, using them as an article of food.

ROUTINE WORK.

The following table shows the number of routine examinations performed by the laboratory and the increase over those for the preceding year:

	1909	1910
Fæces	7,334	13,910
Sputum	962	1,945
Blood	701	597
Gonococci	14,494	16,944
Waters	169	343
Necropsies	131	378
Miscellaneous	3,083	796
Total	26,874	34,913

THE SERUM SECTION OF THE BIOLOGICAL LABORATORY.

The work in connection with the care and immunization of the cattle used in the preparation of antirinderpest serum was as heretofore, in the hands of the Bureau of Agriculture. At the Bureau of Science, under the immediate direction of Doctor Ruediger, the serum is filtered and bottled and at intervals of a few months its potency is determined on nonimmune cattle and carabaos. Owing to the large increase in the production of antirinderpest serum the filtering apparatus has been practically doubled during the year. The arrangement of the rooms has been changed, a bottle-washing apparatus installed and the germ-proof room remodelled so as to be efficient, while still permitting the supply of a current of fresh air. The preparation of vaccine virus has been continued steadily throughout the year and no difficulties have been encountered.

Cholera prophylactic, plague prophylactic; gonococcus, *Staphylococcus aureus, Staphylococcus albus* and *Staphylococcus citreus* vaccines were prepared in moderate quantities. Antidiphtheritic, antitetanic, anticholera, antityphoid, antiplague, and antidysenteric sera were made in amounts sufficient to supply the demand. Anthrax vaccine, tuberculin, both human and bovine, and mallein were also among the products made available by the serum section. Typhoid, para-typhoid and cholera reagents (killed cultures) for agglutination, agglutinating and bacteriolytic sera in liquid and in dried form, for the purpose of the diagnosis of infectious diseases, as well as normal horse, ox and carabao sera were always kept on hand.

Investigations.—The study of the etiology of rinderpest was continued by Doctor Ruediger, but so far the causative factor remains unknown. Comparative tests with vaccine virus preserved by different methods were undertaken. Experiments were made with dried vaccine virus pulverized, vaccine dried on ivory points, vaccine virus incorporated in vaseline, in lanolin, in 75 parts of glycerine and 25 parts of water; and in 75 parts of glycerine and 25 parts of heated horse serum. The last-named preparation gave the best results.

The question of the comparative susceptibility of cattle to rinderpest was studied, and it was found that in this respect the cattle encountered in the Philippines vary greatly. Certain animals even of the same herd may require far more serum for protection than do others.

A study of the permeability of Berkefeld filters to small bacteria showed that the organisms frequently pass through filters marked V or N, whereas the ones marked W usually furnish a sterile filtrate unless a pressure of three or more atmospheres is used.

THE BOTANICAL SECTION OF THE BIOLOGICAL LABORATORY.

Routine work.—The routine work has been very extensive during the year and has to a greater or lesser degree consumed the time of all the technical employees. Much of this is so specialized that it was impracticable to refer it to untrained native assistants and so far as possible it is divided among specialists. The greatest amount of time is taken by identifications, more than 5,000 having been made during the past twelve months. While in a large proportion of cases these require no more work than is necessary to write the names on the labels, in others, especially in the more critical groups, a considerable amount of time and energy is required. The most important thing to do with current material for the herbarium is to effect its prompt and proper identification, so that the specimens, when mounted, can be distributed into their places. It is not uncommon to find a few, or even many, undescribed forms in the collections which come in, or at least forms not previously found in the Philippines. The distribution of duplicate material into sets for exchange and other purposes also requires time, but the importance of this distribution is such that it can not well be detailed to untrained employees.

These are the two chief factors of the routine work, but others, such as the general supervision of the arrangement of mounted material in the herbarium, keeping the card catalogue of Philippine botanical references up to date, amplifying the latter so as to include economic botany and other similar undertakings consume time. Identifications are continually being made for employees of this and other Bureaus, and for various private persons, while requests for data on various technical and economic questions are constantly being received. The coöperative work in botany within the Bureau of Science lies largely between the staff of the botanical section and that of the chemical laboratory, the members of the latter being engaged in investigating various local vegetable products.

Economic work.—Doctor Robinson has undertaken field work in continuation of his investigations of the Mindoro rubber vine. In Mindoro he studied *Parameria philippinensis* Radlk. His object is to determine whether a commercial possibility exists in extracting rubber from the vine known as *Chonemorpha elastica* Merr., which is found in southern Mindanao and the Sulu Archipelago. No thorough investigation of this subject has been made previously, and Doctor Robinson's work will give us some definite information concerning an industry in which the public is now greatly interested.

In April and May of the present year, Mr. Merrill visited the sugar districts in Occidental Negros to investigate the reported outbreak of the red rot on the sugar cane of the haciendas of that Island. A thorough examination of a number of fields failed to reveal any traces of this disease, or any infection of the cane that might be mistaken for the red rot. Careful search was made at the same time for other diseases due to parasitic fungi, bacteria, or other organisms, but none were discovered. As a result of this investigation it is concluded that Philippine sugar cane is comparatively free from plant diseases, although unquestionably certain parasitic fungi will be found in the Archipelago. However, it is probable that these fungi rarely develop in sufficient quantity to cause serious loss.

Two needs are evident if the work in plant infections and infestations is to be advanced successfully in the Islands: first, a mycologist who is thoroughly trained in the investigation of plant diseases, and second, the enactment of laws regarding the importation of seeds, plants, and cuttings. The mycologist should have full supervision over the work of investigating the diseases of our cultivated plants, be thoroughly trained in the systematic study of parasitic and other fungi, and should supervise the inspection and necessary fumigation of all plants, seeds, etc., imported for propagation.

The control of the promiscuous importation of these articles is deserving of early attention. At the present time no adequate provision is made for their inspection or treatment, or for the destruction of badly infected material. Practically all enlightened countries, and the majority of the colonies of European nations, have comprehensive rules regarding the importation of such material, and it would seem necessary to have laws and regulations similar to those in force in other countries, adopted in the Philippines. It is not uncommon in some communities to prohibit importations of living plants, etc., from certain other regions where destructive pests are known to occur. The statement has been made that the Philippines now suffer from the majority of the known diseases of plants and that many insect pests are present. This is not true. At the present time there are many plant diseases, some of which have assumed serious proportions in other countries, which are unknown in the Philippines, although conditions for their spread, including hosts and other factors, are present in the Archipelago. Undoubtedly, the same can be said of insect pests. No thorough survey has as yet been made, but so far as our investigations go, it seems to be evident that the majority of our staple crops are at present rather remarkably free from destructive fungus diseases. The logical course to pursue then would be to restrict the promiscuous importation of plants. Funds spent in an enlargement of the botanic and entomologic work of the Bureau, so as to make it possible successfully and intelligently to carry out such measures would obviate disastrous cost in the future. It is cheaper to prevent the entrance of a disease, than to combat it afterwards, as is demonstrated by the experience of all countries with infections of cattle.

Systematic botany.—As in previous years, much time has been given to systematic botany in identifying and classifying our rapidly increasing collections of Philippine plants. This work is essential, and should be prosecuted vigorously until we have a fairly comprehensive knowledge of the Philippine flora, and the information so gained should finally be brought together in the publication of a work on the general flora of this Archipelago.

A number of papers based on the material in the herbarium of this Bureau have been published, others are still in press, and still others, in preparation. The greater proportion of the published material has been of a systematic nature, but one article by Doctor Foxworthy on Indo-Malayan Woods is especially valuable from an economic standpoint because it is the first attempt to correlate Philippine commercial timbers with those of the Indo-Malayan region in general.

It is hoped that funds will be made available to engage a draughtsman for the botanical section, so that drawings of the more characteristic parts of plants can be published with the descriptions. It seems desirable also, in conjunction with this advance, to begin the issuing of monographs on the more important groups of plants.

Exploration.—Botanical exploration has not been extensively undertaken during the past year, the only large collections being made by Doctor Robinson and Mr. McGregor on the Island of Polillo. Small ones have been brought together by Doctor Robinson and Mr. Merrill at points near Manila. During the month of April, after investigating the reported disease of sugar cane in Negros, Mr. Merrill ascended Canlaon Volcano. Although this trip lasted but ten days, much interesting material was secured, especially from elevations above 1,200 meters.

It is desirable that the work of exploration be extended, for many parts of the Archipelago are as yet botanically quite unknown, and the percentage of apparently undescribed forms in some recent collections is surprisingly large, considering the amount of work that has been done on the flora of the Archipelago as a whole. The natural conclusion is that a great proportion of our species is very local. It is not desirable to publish a general "Flora of the Philippines" until almost all parts of the Archipelago have been explored botanically, at least to a certain extent, for such a work to be generally useful for a long period of years to come, should be made as complete as possible.

The herbarium.—The number of specimens received, poisoned, and distributed in the general collection aggregates 8,865 sheets. The material was received from the following sources:

Collections made by employees of:	
The Bureau of Science	2,375
The Bureau of Forestry	2,098
Miscellaneous Philippine material by gift, exchange, etc	911
Foreign material received in exchange	3,481
Total	8,865

Aside from the general collections made by the employees of the Bureau of Forestry and by this Bureau, the most noteworthy accessions have been about 450 specimens collected and presented by Father M. Vanoverbergh, of Bauco, Bontoc, Luzon; about 120 specimens, for the most part representing cotypes of new species, presented by Mr. A. D. E. Elmer; and the first two centuries of a set of plants prepared for distribution under the direction of Mr. Merrill.

The most important collections among the extra-Philippine material received in exchange, are 795 specimens from the Museum of Natural History, Paris, France, representing New Caledonia and Cochin

China; 795 specimens of Kneucker's "*Glumaceæ exsiccatæ*"; 397 specimens of Indian and Malayan plants from the herbarium of the Royal Botanic Garden, Calcutta; 196 Javan and New Guinea plants from the department of agriculture of the Netherlands Indies, Buitenzorg; about 150 ferns, mostly A. Henry's Chinese collections from the United States National Herbarium; 200 Australian plants from the Botanic Garden, Sydney, New South Wales, and 743 specimens of tropical American plants from the Field Museum of Natural History.

The total number of specimens now in the herbarium is approximately 82,600: of which about 54,600 are Philippine, and the remainder extra-Philippine.

Exchanges.—Below is given a summary of the distribution of botanical material for the past twelve months:

United States National Museum, Washington, D. C.	3,790
New York Botanical Garden, Bronx Park, N. Y.	2,278
Royal Botanic Gardens, Kew, England	145
Kgl. Bot. Garten und Museum, Berlin	3,670
Royal Botanic Garden, Calcutta	1,651
United States Department of Agriculture	152
Department of Agriculture, Buitenzorg, Java	1,999
Royal Botanic Garden, Singapore	950
Botanical and Afforestation Department, Hongkong	406
Herbarium of Prince Roland Bonaparte, Paris, France	3,925
College of Agriculture, Los Baños, Laguna, Luzon	585
Total	19,551

This material was distributed in the general exchange account, but in addition, 1979 specimens were sent to specialists for identification, or for the verification of identifications made in this Bureau; the list is as follows:

Lichens to Dr. E. A. Wainio, Helsingfors, Finland	401
Mosses to Dr. V. F. Brotherus, Helsingfors, Finland	185
Scale mosses to Mr. F. Stephani, Leipzig, Germany	172
Fungi to Dr. G. Lindau, Berlin, Germany	651
Cyperaceæ to Rev. G. Kükenthal, Coburg, Germany	166
Polygalaceæ to Dr. R. Chodat, Geneva, Switzerland	25
Sapindaceæ to Dr. L. Radlkofer, Munich, Germany	43
Palmæ to Dr. O. Beccari, Florence, Italy	63
Rubus to Dr. W. O. Focke, Bremen, Germany	36
Symplocos to Dr. A. Brand, Frankfurt a. d. Oder, Germany	21
Gesneriaceæ, *Eria*, and *Canna* to Dr. Fr. Kränzlin, Berlin, Germany	71
Piperaceæ to Dr. C. de Candolle, Geneva, Switzerland	63
Selaginellaceæ to Dr. G. Hieronymus, Berlin, Germany	31
Menispermaceæ to Dr. L. Diels, Berlin, Germany	18
Monimiaceæ to Dr. L. Gilg, Berlin, Germany	11
Bambuseæ to Mr. J. S. Gamble, East Liss, Hants, England	15
Cunoniaceæ to Dr. R. Pampanini, Florence, Italy	7
Total	1,979

The total number of specimens distributed was therefore 21,530.

Loans of mounted herbarium material to specialists who are working on monographs of special groups, or who are working up the Philippine representatives of these groups are as follows:

Orchidaceæ to Mr. Oakes Ames, North Easton, Mass	155
Polygalaceæ to Dr. R. Chodat, Geneva, Switzerland	132
Piperaceæ to C. DeCandolle, Geneva, Switzerland	36
Palmæ to Dr. O. Beccari, Florence, Italy	5
Selaginellaceæ to Dr. G. Hieronymus, Berlin, Germany	98
Cyperaceæ to Rev. G. Kükenthal, Coburg, Germany	88
Eria to Dr. Fr. Kränzlin, Berlin, Germany	23
Rubus to Dr. W. O. Focke, Bremen, Germany	61
Monimiaceæ to Dr. E. Gilg, Berlin, Germany	7
Bambuseæ to J. S. Gamble, Esq., East Liss, Hants, England	100
Total	705

A special shipment, in addition to the above, has consisted of 120 specimens of 42 different species of grasses and sedges which were forwarded to Mr. A. Kneucker, Karlsruhe, in return for his series of "*Glumaceæ exsiccatæ.*"

Arrangements for an exchange of Philippine plants for those of China have been made with the Director of the Royal Botanical Garden at St. Petersburg, Russia, while proposals for a similar exchange have been forwarded to several other institutions. A special arrangement has been made with Oswald Weigel, of Leipzig, Germany, by the terms of which he will undertake to supply the library of this institution with certain desired books on natural history subjects in return for such duplicate botanical material as we can send to him.

A botanic garden.—The desirability of establishing a botanic garden in the Philippines has been emphasized in previous annual reports. The value of an ample and well-equipped institution of this nature can not be overestimated. Such a garden should prove a strong factor in educating the public, while at the same time it would serve as a place of recreation. It should be in, or near, Manila. However, objections can be made to this location because of the soil conditions and drainage, the prevalence of destructive typhoons, and for other reasons. A botanic garden should take the lead in the importation of useful and ornamental plants and in their distribution in the Philippines. Various species should be imported from other tropical countries; and the improvement of native and other species by selection, cross-breeding and other means undertaken. Ample grounds for propagating are required for this purpose, as well as diversified soil conditions. It will prove difficult to find a suitable location that will combine all of the qualifications desired in a botanic garden, namely accessibility to a large public, together with a properly diversified and ample area of land adapted to the purpose. However, the botanic gardens of Penang, Singapore, and

Buitenzorg, as well as those of temperate climates, have shown how important these institutions are, not only in an educational and economic way, but also as a great attraction to the traveling public.

ENTOMOLOGIC SECTION OF THE BIOLOGICAL LABORATORY.

Routine work.—The work of identifying, classifying and storing entomologic material which has been collected by the staff, sent to it, or obtained by exchange, has been continued regularly during the year and as a large amount of material preserved in alcohol had collected, a considerable proportion of the total time of the employees of this section has been devoted to the mounting and accessioning of insects. An entomologic collection in the Tropics is very delicate. It is subject to deterioration from mold and other pests and must constantly be watched to insure its continuing in good condition.

It has been possible, despite the amount of work which was necessary, to improve the condition of the collection and to make several expeditions to places not generally visited. The accessions to the collection have likewise increased during the past year and they represent many species and genera which are new. Material is coming into the Bureau from persons not connected with the staff, who understand the methods of collecting. The number of insects accessioned to the end of June was 13,267, an increase of approximately 2,000 over the previous year. These accessions represent a total of about 2,000 numbers averaging about 5 specimens to the number. Although continued efforts have been made to keep the collection mounted, much material is still stored because the present quarters are not large enough to take care of all the insect boxes needed, and the final adjustment must wait until the new wing of the laboratory is finished. A visit made by Mr. Banks to the summit of Canlaon Volcano, an opportunity for which occurred while the investigation of the insect pests in the Island of Negros was going on, gave the most remarkable results, for in three hours on the summit there were obtained specimens representing 371 species, 140 genera and 47 families.

The Bureau wishes to express its thanks for the following donations: Dr. Auguste Forel, Yvorne, Switzerland, indentified Formicidæ of South America, India, and Africa; Mr. E. E. Austen, British Museum, London, identified Diptera including several species of the tsetse fly; Mr. George Compere, government entomologist for West Australia, identified Diptera including *Dacus ferrugineus* Fabr.; Dr. J. M. Atkinson, Victoria Hospital, Hongkong, a collection of *Lispe sinensis* Schiner; Mr. D. C. Worcester, Mr. R. C. McGregor and Mr. A. Celestino, Manila, a large collection of insects from the east coast of Luzon and contiguous islands; Father F. Sanchez, S. J., Ateneo, Manila, a large collection of insects from Baguio; Messrs. H. M. Curran, E. E. Schneider, J. Alvarez, Bureau of Forestry, Manila, collections of forest insects; Mr. E. M. Ledyard, College of Agriculture, Los Baños, miscellaneous insects; Messrs. C. H. Lamb and C. M. Weber, Bureau of Prisons, Iwahig, Palawan, miscellaneous insects; Mr. G. L. Parks, Bureau of Education, Manila, Lepidoptera. Many others have donated single insects from time to time during the year and have been credited upon our records.

Systematic entomology.—The identification of material has gone forward quite rapidly. Rhynchota (Hemiptera), Coleoptera, Orthoptera, Lipoptera, Diptera, and Hymenoptera are now in such a condition that the greater part of the material brought into the Bureau can readily be identified from the collections. This condition has been made possible not only by the visits of Mr. Banks and Mr. Schultze to Europe, but by the hearty coöperation of a number of specialists whose interest was secured during these journeys. Material has been sent to the following gentlemen and identified by them: Dr. W. Horn, Berlin, *Cincindelidæ;* Dr. F. Ohaus, president, Deutsche Entomologische Gesellschaft, Berlin, *Rutelinidæ;* Capt. J. Moser, Berlin, *Melolonthidæ;* Oberförster H. Strohmeyer, Oberelsass, *Scolytidæ;* Mr. H. Viehmeyer, Dresden, *Lycænidæ;* Mr. J. Weise, Berlin, *Chrysomelidæ, Coccinellidæ;* Dr. A. Forel, Yvorne, Switzerland, *Formicidæ;* Dr. K. M. Heller, custodian of the K. Zoöl. Anthrop.-Ethnographisches Museum, Dresden, *Curculionidæ;* Mr. E. E. Austen, British Museum, London, *Diptera;* Mr. W. L. Distant, British Museum, London, *Hemiptera.*

In addition to the work by foreign specialists, the determination and the arrangement of the Hymenoptera have been pushed not only for economic reasons, but also because of the large available number of ants. The previous year was largely devoted to mosquitoes.

Messrs. Weber and Schultze made a collection in Palawan; and with its aid the identification of the material in Rhynchota has been completed and two papers have been published. Attention was also given to Lepidoptera, and the work published in the Philippine Journal of Science. A number of papers on entomologic subjects in the Philippines have been contributed by European and American specialists.

Taking it altogether, the entomologic collection, which is one of the most difficult to keep in proper order, is gradually being brought into such condition that it can become a reasonable working basis for economic entomology in the Islands. It is for this reason that an additional position for an entomologist was provided in the appropriation bill for the fiscal year 1910. Mr. Charles R. Jones has come to Manila to fill the place, the object being to develop the economic side of the science.

Silk culture.—The cultivation of the silkworm at the Bureau of Science is now entering its fifth year and it continues to present as feasible an aspect as when the cocoons were first introduced from Ceylon. No signs of disease have appeared and there has been a continued improvement both in the appearance of the silkworms and of their cocoons.

The introduction of the Japanese strain into the Ceylon variety has resulted most satisfactorily and without cutting down the number of generations a year, there seems to be an improvement in the quality of the silk. The mulberry trees planted on the Bureau of Science grounds thrive, and with the exception of some slight attacks of fungus, which are not serious, the plants have been perfectly healthy. Vigorous cutting back to the stem improves their growth in a marked degree and renders the leaves more accessible to the worker. Our experience has proved beyond a doubt that with proper care and attention the mulberry can flourish in the Philippines as well as in any other country.

After cultivation of the silkworm was undertaken by the Bureau of Science and when we had concluded that the feasibility of raising silk from the variety which we had imported was demonstrated, the immediate care of the worms was turned over to the Bureau of Agriculture. However, after about a year of work, that Bureau requested us once more to take charge. Consequently a new and well-equipped breeding house was built on our grounds. This house is intended solely for the propagation of the worms and eggs and not for larger experiments in the production, spinning, and weaving of silk, the entire process having passed beyond the experimental stage. The Bureau, through the kindness of the Department of Agriculture of the United States, obtained a modern silk-spinning machine, operated by power and had one-half of this apparatus provisionally mounted in the laboratory building, the other half being used for demonstration purposes at the Philippine Carnival. However, this machine occupies practically one entire room and quarters for such an apparatus in a building not primarily intended for the purpose should not be given any longer than is necessary.

The teaching of the spinning and weaving of silk in the Islands should be the function of the Bureau of Education. Education along this line is most certainly connected with the mechanical trades, the trade itself is new and if properly followed and pushed would greatly add to the commercial development of the Archipelago. The dean of the Philippine College of Agriculture has already taken steps to plant and cultivate a large number of mulberry trees. The Bureau of Education, during the year has sent five teachers to the Bureau of Science for a period of from two to three and a half months each, to study in the silk laboratory. They subsequently were assigned to work in the industrial schools in Albay, Cebu, Ilocos Norte, Pangasinan and Pampanga. Mulberry slips have been planted in a number of these provinces, owing to the encouragement of the Bureau of Education, and if the work continues with an increment of velocity equal to that of the present year, the time should not be far distant when a reasonable amount of silk will be produced by the united efforts of a number of isolated communities.

In pursuance of the belief that the continued development of the spinning and weaving is not the function of the Bureau of Science, the loan of the silk machine was offered to the Philippine College of Agriculture and arrangements have been completed with the dean of that institution to transfer it to Los Baños where instruction not only in the propagation of the insect, but also in the spinning and weaving of the materials can be given. This course was taken only after the machine had been offered to the Manila Trade School and declined by the Director of Education.

The Bureau of Science has made efforts both in Italy and in Spain to ascertain if any person or persons thoroughly trained in silk culture would be available, for the crying need of the industry in the Philippines is instruction, not by amateurs but by professionals. An amateur may be able in time to do fairly well and to imitate with a greater or less degree of success silk spinning in countries where the industry has existed for centuries, but he never can have the skill or the knowledge of those who have spent their lives in countries where silk is one of the main industries. We have succeeded in locating one man, Sr. Gaspar Baleriola Ramirez, who has since a child been connected with the Government institution for sericulture in Murcia, Spain. It would seem as if such a person would be preëminently fitted for the very purpose in view, as he is familiar with the entire process of silk culture, spinning and weaving, as well as the diseases to which both the silkworms and the mulberry are subject. If silk culture is to be pushed in earnest, I can only advise that the services of Señor Ramirez be secured for field work in this connection. It would seem to make no material difference whether he be connected with the Bureau of Agriculture, Bureau of Education, or the Philippine Agricultural School, if he can reach the provinces and can give the instruction sought. An additional advantage in the employment of Señor Ramirez would be his knowledge of the Spanish language and the ease with which he could learn the native dialects.

The attempts of this Bureau to instruct Filipina girls in silk spinning have been continued, but we find it difficult to arouse the proper interest at the present time, and we are amateurs as well as they. However, great interest will undoubtedly develop as soon as the people at large grow mulberries and are brought face to face with the culture of the silkworms. Silk culture should also be very satisfactory to persons having a certain amount of capital. Like the cultivation of coconuts, it has two sides: namely, it is a matter in which the small landholder can become interested and by which he can make some money each year; it is also one in which larger estates could very well engage.

However, with the many other serious entomological problems before us, it does not seem as if the Bureau of Science should indefinitely continue to exercise more than a supervisory care over this industry, except in the cultivation of eggs for distribution. The importance of this question to the Islands may be realized when we consider that we annually import close to ₱1,000,000 worth of silk, both raw and finished, and when we also consider that the development of the industry would not only in large part cover this importation, but would probably add several million pesos per year to the exports of the Islands.

Experiments have also finally been successful in inducing the Eri silkworm to thrive in the Philippines. After several attempts, Dr. W. E. Musgrave, while he was a delegate to the Medical Congress at Bombay, brought with him, at the request of the Director of the Bureau, and successfully, a number of the cocoons. These have propagated and are now producing cocoons of an excellent quality, but up to the present time, because of the lack of proper machinery, we have not been able to reel the silk. However, through the courtesy of Professor H. Maxwell Lefroy, the imperial entomologist of India at Pusa, we have received a small machine for this purpose and experiments with it will be carried on very soon. The importance of the Eri silkworm can be realized when it is recalled that it lives upon the leaves of the castor-oil plant which grows so luxuriantly in these Islands. There is every reason to believe that the cultivation of the Eri silkworms would find a ready development at the hands of some of the northern Filipino people, such as the Ilocanos, and possibly of the Moros. This statement is made because the former are proficient in the spinning and weaving of cotton and the latter make many articles of silk apparel.

Mosquitoes.—A series of experiments has been carried on during the year with the view of determining the percentage of the different mosquitoes which are caught in dwelling houses in Manila, this in order to decide what classes of breeding places furnish the most serious sanitary problems in Manila.

SECTION OF FISHERIES OF THE BIOLOGICAL LABORATORY.

Systematic work.—The classification and determination of the collection of fishes has been vigorously pushed. This collection now contains over 10,000 specimens of Philippine fishes; 47 new species have been described, 203 species heretofore unrecorded from the Philippines have been listed and a better understanding reached of the varieties of food fishes in and around the Islands. This knowledge can be used as a basis for future intelligent work in fisheries. The fish collection, as is the case with others in the Bureau, is in a room not intended for the purpose and work is very much hampered by its crowded condition. This will be relieved when the new wing is completed.

Sponges and pearls.—Mr. Seale has prepared articles for the Philippine Journal of Science on the sponge and on the pearl fisheries. The work on sponges gives descriptions of species so far as possible, together with the locations where they may be gathered and the prices of the commercial varieties so far as they can be ascertained by personal inquiry in the United States. The methods of cleaning and preparing sponges for the market are also described. The result has been the receipt of numerous letters of inquiry from the United States and Europe.

The discussion of the pearl fisheries gives in detail what has been accomplished in the study of the growth and structure of pearls and pearl oysters. The location of pearling beds in the Philippine has been described and the yield of oysters, together with their value.

General marine products.—The general marine products of commercial value to the Philippines, such as trepang, tortoise shell, and coral have been given some attention, but these subjects are not yet in a condition for publication. Some minor work was also done on poisonous fishes of the Philippines and the food fishes found in the Manila market. Mr. Seale also took the opportunity of visiting Borneo on the United States Fish Commission steamship *Albatross* and the first steps were taken by this means in establishing the relationship of the fish fauna of these Islands with those of surrounding waters. An exhibition series of the important food fishes is also being prepared. The attempt to obtain statistics in regard to the fishery industry of the Islands in general has also been continued and while replies are slow in coming in, the data so obtained are daily becoming more useful. Exchanges have been inaugurated with Standford University and the Australian Museum, and specimens of fishes from Formosa, Japan, and a number of other Pacific Islands have come to the collection to be used for comparative purposes. The visit of Mr. Seale to Hongkong will give opportunity for securing a collection of representative fishes found in the markets of that colony.

Black bass.—Approximately 100 young black bass were planted in Trinidad Lake, in Benguet, in 1907. These have multiplied and the lake is now well stocked, despite the severe typhoon experienced during the latter part of 1909. A spawning pond has been arranged near the Hotel Pines, the banks of the existing lagoon having been raised to prevent overflow, concrete gates put in and proper screens provided. Twelve mature bass caught with a fly in Trinidad Lake were transferred to this spawning pond on February 23. The fish had spawned on May 3 and hundreds of black bass appeared in the shallow waters near the shore. Several of the adult fish were brought to Lake Caiman, near Los Baños, and planted May 7, 1910. Young bass can not be transported until they are from 8 to 10 centimeters in length, therefore an attempt on June 16 to transfer fry of 6 centimeters was unsuccessful; only one survived, but this one is perfectly at home at the temperature of Manila. Subsequently, another trial was made and about forty fish brought to this city in good condition. These have been transferred to the colony of Hongkong in response to the request of the colonial secretary.

There are a number of lakes in Laguna Province well adapted to black bass and there are other situations in the Islands that should be taken care of; as soon as fish become available, this work will be done.

Condition of the work.—The formation of the collections now existing and the work in classification and identification which has been done, has placed the study of the fisheries in such a condition that field work can be carried on successfully. The species of fish found in these waters have to a great extent been identified and some slight knowledge has been gained of their habitats and habits. Some regions in the Islands, and Lake Bay is especially in mind, are rapidly becoming exhausted while other fields are practically virgin. Attention to the propagation of fish with special reference to the exhausted localities would be of advantage. Species such as the striped bass and possibly the shad would probably thrive in Lake Bay. The Filipinos, as do all Oriental people, depend to a large extent upon fish as an article of diet, but in many parts of the Islands they are expensive and difficult to procure. The importation by one firm alone of 21,000 cases of salmon would seem to emphasize the fact that a great need for fish exists in the Philippines and that with an abundance in our own waters we do not begin to meet the local demand. We have only one man engaged in the study, we do not control a vessel, and our expeditions are dependent upon native bancas and primitive appliances. The main portion of the work must at present be systematic and with specimens preserved in alcohol.

The development of the fisheries, like so many other functions of a scientific bureau, would bring results in the future. Immediate commercial returns can not be expected, for the broad foundation of the intimate knowledge of the habits of our food fishes must first be obtained. The museum specimens are interesting and fundamental from a systematic standpoint, but the fish in the jars are dead, and what we need to know is their life habits.

The questions of adequate enlargement of the work in fisheries, the providing of a vessel for this purpose, the establishment of a floating laboratory in the Islands, and the enlargement of the staff have been emphasized in previous annual reports. The type of vessel and type of floating laboratory best adapted for the purpose have been discussed. Such an enlargement of the functions of the section of fisheries of the biological laboratory of the Bureau of Science can not be brought about without additional funds. Mr. Seale does such field work as is possible with the facilities at the command of the Bureau, but in marine work comparatively meager facilities do not give the maximum return for the money expended. It has never been the policy of the Government to abandon any line of work which it had deliberately undertaken; therefore, it would seem as if the only course open to it would be to provide for the adequate development of the scientific study of the marine fauna of the archipelago. In considering this question, the fact must not be lost sight of that new pearling grounds, new spawning beds, possibly precious coral, and other marine products will come into the field of the work of exploration. It is possible that a coast-guard cutter placed at the disposal of the Bureau of Science, with dredging and fishing apparatus could be utilized to the best advantage, although I am still inclined to believe that, all other things being equal, a floating laboratory, which would be anchored in the different parts of the Islands and which would have as an adjunct an auxiliary power sailing vessel, would result in the greatest good to the greatest number.

This question of the systematic and scientific study of the habits of our fishes and other marine fauna is independent of any immediate problem which might be solved by deep-sea trawlers working independently of the Bureau of Science. The trawler will only secure fish for the market, it will do nothing toward the development of the industry throughout the Islands and toward the preservation and propagation of the fish and of the pearl, sponge, and coral beds.

In this connection attention should be called to the fact that the Philippine Medical School, which will soon be incorporated with the Philippine University, has adopted the policy of establishing a department of biology with an associate professor of zoölogy in charge. This department, as is the case throughout the world, is and will be largely interested in marine organisms. It will undoubtedly be benefitted by the development of work in fisheries and undoubtedly it will coöperate with the staff engaged in the latter work, so that all the trained assistants can be in the field during vacation time.

THE SECTION FOR THE COLLECTION OF NATURAL HISTORY SPECIMENS OF THE BIOLOGICAL LABORATORY.

The following localities were visited by Mr. McGregor: Pauai, Mount Pulog, Benguet; Dalupiri, Batan and Sabtan, islands north of Luzon; Claveria and the Abulug River, on the north coast of Luzon; Palanan, Baler, Casiguran, on the east coast of Luzon; Polillo Island, Sibul Springs, Bulacan. Mr. McGregor also completed the second part of his Manual of Philippine Birds, which was published during the fiscal year, and prepared seven papers on birds for the Philippine Journal of Science. Dr. R. W. Shufeldt, of New York, wrote a monograph on the osteology of Galeopithecus, which is based upon material obtained from the Bureau of Science. This has been returned to the author for final revision. Work on the study of the foods of the Philippine birds has been begun and an adequate record, which at the present time covers an examination of some three hundred stomachs, has been undertaken. The Manila market has been closely watched and the species of birds which are exposed there for sale have been listed, data being obtained in regard to their abundance and the time when they are obtainable. This list now refers to fifty-five species.

A price-list of bird skins has previously existed in the Bureau but recent similar lists obtained from dealers throughout the world have shown that our own must be revised. The question of the alteration of the list of bird skins has brought up the broader question of the sale of collections in all departments of the Bureau devoted to systematic biology. The entomologists have a large amount of material which can be placed upon the market; a list of it has been prepared and is now practically ready for publication.

The botanical section has already made arrangements with a book dealer in Europe for the exchange of botanical specimens for books and sets which we need. The collection of fishes has not as yet been placed in condition to provide much material, but Doctor Griffin, in his work on the marine fauna, has collected and brought together a considerable amount of material which should be available for sale.

The systematic preparation and the selling of specimens of all kinds and the regular issuing of catalogues and of advertising would be an undertaking which in time should yield a considerable revenue, although at first this might not be the case, as the greatest demand would be in museums where exchanges could be offered. However, this work cannot be undertaken until we have opportunity to give it space entirely for its own purposes, and this will not occur until we have occupied the new wing. An undertaking of this kind must also be followed and advertised systematically. There should be one man who is capable of doing the work and who can devote his time to it. The actual preparation of specimens could be left to Filipino assistants. The reputation of the Naples Aquarium is such that its material is now sought throughout the world and it has no immediate necessity for advertising. It also has the advantage of being near the educational centers, but a sum of money expended at the present time in bringing our collections to the attention of the world will eventually give us a similar prestige, and then the returns would begin to come in. This undertaking would involve the use of additional funds at the beginning which should be regarded to a certain extent as an investment. Mr. McGregor, who has for many years been in charge of the collection of natural history specimens, would be eminently fitted to be put at the head of this work and its development would aid all the biological branches, which are now enlarging their collections and exchanges independently.

Work in general zoölogy.—Dr. Lawrence E. Griffin, associate professor of zoölogy in the Philippine Medical School, has in default of a laboratory of his own, pursued his work in the Bureau of Science, and he will continue to do so until the building of the Philippine Medical

School is completed. The result has been that we have obtained a collection of snakes and other reptiles from various parts of the archipelago and 20,000 land and fresh water shells have been received during the year. Four hundred lots of shells, including 2,000 specimens, have been sent to the United States National Museum for identification. An attempt to arouse interest in the collection of shells, by offering a prize to the Philippine school or individual making the best collection, resulted in no great advantage. It seems better to rely on our own men in the field.

In addition to the work in collecting Doctor Griffin has undertaken an investigation of the structure and life history of *Euplotes worcesteri* n. sp., and this is developing facts of interest. Doctor Griffin's research work is in part ready for publication and his investigations on the subject of Philippine protozoölogy have steadily advanced. Although Doctor Griffin is not directly connected with the Bureau of Science, except as an assistant without pay, he has, nevertheless, by his work practically established a new section in the Bureau.

THE CHEMICAL LABORATORY.

Mr. George F. Richmond, who for three years has been chief of the chemical laboratory, and who has been connected with the Bureau for more than six years, resigned in April to assume a position in a new paper manufactory to be established on the border between French Indo-China and China proper. Dr. Raymond F. Bacon left permanently for the United States in the same month. Mr. L. F. Salinger resigned in November and Mr. Herbert S. Walker in July. The laboratory therefore lost four of its chemists. On the other hand, Mr. Walter B. Gonder, who has made a special study of the commercial chemistry of sugar, joined the Bureau in April, 1910, and we have also succeeded in filling two of the remaining positions. As Mr. Gonder was called to fill a new position authorized by the appropriation bill for the fiscal year 1910, it will be seen that the laboratory has given up two salaries which formerly were devoted to American employees; in return there have entered the laboratory Mr. José del Rosario, Mr. A. S. Arguelles and Mr. T. Dar Juan, all Filipino Government students who have completed their studies in the United States; two of these, Messrs. del Rosario and Dar Juan, were especially trained for our work in the Massachusetts Institute of Technology and in the University of Chicago. This policy, which has been outlined in previous reports, of gradually bringing in young Filipino chemists who shall for the present do routine work and who shall be given opportunities to advance in the Bureau, has been pursued steadily and the number of positions available to Americans gradually diminished. There are now engaged in the chemical division of the Bureau of Science six young Filipino chemists. The other part of the plan, by which we should gradually have a few well-paid research men is slowly being realized, and an effort should be made in accordance with the advance of the Filipinization of the force, to make the salaries of the men in charge sufficiently large to retain them in the service. Unfortunately, we have not been able to do the same in the biological laboratory, because students of medicine all seem determined to follow the clinical branches, and with one exception, have not pursued special laboratory studies in America. Our own students from the Philippine Medical School are not yet available.

The work of the division of chemistry is of such a nature that it can not readily be controlled in its details by one man. The science itself throughout the world is naturally divided into physical chemistry, general and inorganic chemistry, and organic chemistry. The first three of these branches are often studied together, so that the inorganic chemist as a rule has a fundamental knowledge of physical chemistry. The organic chemist has generally not such an extensive training in that branch. In a laboratory such as ours, where much routine work of various classes needs to be done, it has been difficult and always will be almost impossible to secure one man capable of intelligently advising in the two distinct branches of the science; so that, with the departure of Mr. Richmond, it has seemed expedient to divide the laboratory work on the one hand into inorganic and physical chemistry, and on the other, into organic chemistry; the former branch includes the large amount of routine work on cements, clays, coals, alloys, minerals and other similar products; the latter, the large division of the work brought about by the Food and Drug Inspection Act, the determination of morphine and other alkaloids, work with paints, oils, varnishes, alcohols, sugars and similar products.

Routine work.—The routine work during this year has increased over the previous one. The following tabulation shows in general the amount which has been accomplished. The compilation of the work on foods and drugs is included in a table at the end of this report.

TABLE I.

	1909	1910
Oils, paints, pigments, etc.	123	61
Fertilizers, cements, clays, soils	3,076	3,342
Fuels, wood, gas and petroleum	8	7
Metals and alloys		24
Water	99	82
Urines, clinical and toxicological analyses	436	400
Miscellaneous	462	248
Examinations made under the Food and Drugs Act	509	1,004
Total	4,713	5,168

The volume of work on the examination of cements has continued to be very large, and of late an increasing demand for the testing of the strength of concrete has developed. We have now studied so many samples of imported cements, that we are very familiar with the characteristics of all of the chief brands. However, the strength of a structure depends not only on the quality of the cement used in it, but also upon that of the sand and gravel which go to make the mixture as a whole. Obviously, the whole can not be stronger than its parts, and if the gravel will resist less strain than the cement which binds it together, a loss in strength in the structure results, regardless of the quality of cement which is used. It therefore becomes evident that the next and most important step in the development of public works, in the construction of which concrete is used, must be provision for the adequate testing of the latter. The result is twofold, not only do such tests show whether the gravel and sand are adequate and whether other sources of these materials must be sought, but they also, by giving proper preliminary data in regard to the strength of the material, enable the builder to select leaner mixtures, and thus while saving in cement, to build a stronger structure. In view of the above conditions the necessity of providing adequate machinery for testing and of constructing a building in which to carry on this work, need not further be emphasized. The saving on one large undertaking would more than repay the cost of the laboratory. It is hoped that this phase of the work may be developed during the next fiscal year.

The routine work on foods and drugs has been so great that the laboratory practically has been compelled to confine itself to products obtained through the custom-house. The large field of native foods has scarcely been touched; nor can much in this line be undertaken at present.

The development of the system of artesian wells throughout the islands has for the past two years made such demands upon the chemists doing water analyses, that Mr. Gana, who devotes himself to this branch of the work, has had no time for anything else.

The public is also, year by year, making greater use of the facilities of the laboratory. It has been deemed expedient, in view of the desires of the mining community that the work of assaying should be put upon a permanent basis so that there should be no variation in the personnel for some time to come, to transfer this work from the chemical laboratory to the division of mines and to make an effort to secure all of the business possible in the Islands. It is hoped that within the next year a very large increase in the number of assays made by the Bureau will result. Mr. Paul R. Fanning, who has been engaged for this work, will also be able to undertake other tests on ores.

The number of routine examinations undertaken by the chemical laboratory has now become so great that a new system of reference cataloguing, by which the chief of the division shall always have at hand all the data in regard to every analysis which has been made, became necessary; and while the revision of our system so as to include a larger number of facts in regard to each analysis than was heretofore required has taken much time, it is now completed and the results have added greatly to the efficiency of the work, thus furnishing another example of the fact that speedy, accurate, scientific results are largely dependent upon a clerical adjunct. It is not the custom to consider clerical work as very necessary to scientific institutions, but as the object of a collection of laboratories such as the Bureau of Science is to obtain results as quickly and as thoroughly as possible, and as it must constantly refer to past decisions, it can readily be seen that the building of a competent clerical force must go hand in hand with scientific development.

INVESTIGATIONS.

Manila copal.—The division of chemistry, as in the past, has continued its investigations of the chemistry of the natural products of the Islands. Mr. Richmond, before he left, completed his work on copal and oleo-resinous varnishes, bringing into consideration, in addition to Philippine copals, the use of Philippine oil and turpentine. The results have been most satisfactory and the paper which he has prepared for publication should serve as a guide for future work. The interesting question of the chemistry of copal and other resins has not been followed out with any great completeness, as it was not deemed the function of the Bureau of Science to pursue this question beyond the point where the facts had a direct bearing on the commercial development of the materials.

Essential oils.—Doctor Bacon compiled for publication all of his results obtained on the production of essential oils which might be of commercial value in the Philippines. One topic which he investigated in conjunction with Mr. Richmond, namely, the essential oil from the champaca flower, is still in so incomplete a state that the work has been continued by Mr. Brooks. In the case of perfumes such as that from champaca it is extremely difficult to obtain even approximate estimates of their value from European manufacturers; the valuation depends so much upon the amount available, as well as upon the quality of the product and the market for these preparations is so sensitive that dealers are very slow to give opinions. Obviously, the general use of a perfume such as champaca necessitates the guaranty of a certain maximum quantity, as dealers can not afford to put out certain brands of perfumes in very small lots.

The tropical sunlight.—Mr. Gibbs, in developing the work of the food and drug laboratory has been led into rather an extensive study of phenol and anilin and the reason for their rapid coloration in these climates. There has been so much discussion in recent years concerning the effect of sunlight upon Europeans residing in the Tropics that the laboratory deemed it advisable to enter into a series of more exact measurements of this factor in our environment. The action of the sunlight upon stock chemicals, undertaken by Mr. Gibbs, naturally formed a part of this work. We have also undertaken to study the range of the spectrum of the sunlight, not only in Manila, but at the higher altitude of Baguio, with a view to determining whether the range of ultra-violet is greater here than in a northern climate. The results obtained at present seem to show that there is practically no difference and that, if any exaggerated effects of tropical sunlight really do exist, and if they are referable to the ultra-violet light in the sun's rays, the controlling factor must be one of intensity and not of range.

Doctor Bacon continued his work on the sensitiveness of uranyl acetate and oxalic acid, which mixture decomposes in the sunlight and the rate of decomposition of which forms a measure of actinic intensity of the latter. He was enabled during his leave in America to make comparative measurements between Chicago and Manila, showing a greater rate of decomposition here than in the American city. However, this reaction is one which is subject to variations through very slight factors and since Doctor Bacon's departure a continuation of the work has brought us to a more intimate knowledge of the causes of these variations. We have been able to compare Manila with Baguio, although the series of observations in Baguio was very limited. So far, the intensity of the sunlight seems to be about the same in both places under the same conditions. The question of the ionization of the air by the tropical sunlight has also been given attention and daily measurements are being made. It is hoped that by continuing the taking of records for the entire year we may obtain definite results which will give us a fundamental explanation of the various aspects of this vexed question. In order to accomplish the best work and also for the general use of the laboratory, we will need to purchase an adequate spectrograph. While such an instrument can be used for the measurement of ultra-violet light in the sun's rays, it is also becoming quite necessary to enable us to make rapid spectroscopic examinations of many minerals and mineral substances which come into the Bureau, with special reference to the discovery of rare earths.

Cement.—Mr. Reibling has continued his extended investigations upon the behavior and aëration of cements in the Tropics and has studied the development of Alfred H. White's test for free lime in cements. He has prepared a mass of material for publication which is too complex for a brief abstract. This paper should serve as an adequate basis for the future consideration of all cements which we handle and incidentally it confirms our previous results. It is only by gathering together the work of the members of the staff in one publication that we can record steady advance from year to year. Future cement testers in the Bureau of Science will need to found their work upon the papers prepared by Mr. Reibling. Mr. Reibling also visited Hongkong and Haiphong at the request of the cement manufacturers in those places; through their courtesy he was enabled to spend a large amount of time actually in the works studying the fundaments of his testing problems at first hand, and to suggest certain changes in methods of manufacture which have resulted in giving us a more uniform quality of cement. The report which he has made embodies much information obtained from private sources and it could not therefore be published; in lieu of publication it was transmitted to the Secretary of the Interior for his information and for the use of the public at his discretion. However, the experience of Mr. Reibling gained in the factory will be applied to his work in the laboratory.

Alcohol.—The subject of the Philippine alcohol industry is of great importance to the Islands, and because of this Mr. Gibbs has during the past year made Philippine alcohol, its method of production, the materials which are available for use, their distribution and value, the subject of study. As this work includes a comprehensive investigation of such plants as the buri palm, nipa palm, the tuba from the coconut, and alcohol from other sources it is obvious that the work must still take some time; however, it is fairly well along and will be ready for publication within the next few months. In this connection it is interesting to note that not only the sap of the buri palm, but also that of the nipa and coconut contains from 9 to 17 per cent of sugar. This quantity is so great that the possibility of the commercial manufacture of sugar from these saps is well worth considering; it has therefore been decided to follow this subject more closely through the aid of Mr. Gonder, who is especially interested in these matters.

ILOILO SUGAR LABORATORY.

In accordance with the provisions of Act 1955, the Bureau established a laboratory for the polarization of sugar in Iloilo. It built provisional quarters in a rented house, installed laboratory desks, provided a polariscope room and stocked the branch with apparatus and supplies.

Mr. Herbert S. Walker was sent to Iloilo to take charge. The results have not been gratifying—as indeed had been predicted. The sugar buyer either buys or does not buy a shipment of sugar, making his purchases by relying upon his own polarization; if dispute exists between him and the planter and if the planter has recourse to the Government laboratory, the buyer is at perfect liberty to state that he does not care to buy the sugar on the laboratory polarization. It is difficult to see how a Government laboratory can fix the standards of sugar by its dictum, and compel sugar buyers to pay a certain maximum price. The latter may be politely interested in the figures obtained by the Bureau of Science, but beyond that there is no change in the status of the commercial transaction. The planter on the other hand does not seem to be particularly interested in an accurate polarization of his sugar. Until the two, planter and buyer, can agree as to the value of a Government test of sugar samples, the sugar laboratory will have nothing to do. On the other hand, it should be pointed out that a given sample of sugar is identified by its polarization and that the customs and internal-revenue authorities, whose business it is to handle the papers and the identifications relating to the export of sugar to the United States under the recent tariff bill, should insist upon such identification of the various lots in order to insure the operation of the clause in the bill protecting the small grower. However, unless a regulation is adopted by the Government by which each lot of sugar shall be polarized for identification, the business of the Iloilo branch does not warrant its continuation as a sugar-testing laboratory. It has a certain specific use in being the headquarters for chemists who shall undertake the study of the sugar production in Negros and Panay, but if such scientific investigation is continued the chemist in charge of the Iloilo sugar laboratory can not devote his time to polarization in Iloilo, because obviously he will have to be in the field for a large part of the sugar campaign and will utilize the laboratory only as a place for working up his material.

Mr. Walker was eminently fitted to direct the sugar laboratory; he had spent the entire campaign of 1908–9 in Negros, had become acquainted with all of the planters and all of the dealers, and was well thought of by everybody. If anyone could have brought the two factors in the sale of sugar together on a basis of the admission of Government tests as a prerequisite for the sale of sugar, he could have done so.

Mr. Walker's time in Negros was well spent. The record of his work which was undertaken in pursuance of the policy outlined in previous annual reports, is included in a monograph recently completed which treats of the question of the sugar production of Negros as completely as it can be done at the present time without experiments on other varieties of cane than those now grown and on fertilizers and cultural methods. He has taken up the Island of Negros by districts giving the average production per hectare for each district, the nature of the soils, the amount of land under cultivation, the quality of cane, the results of actual mill tests, the amount of sugar lost by present methods, the costs of production, and the actual money advantage to result from the introduction of central factories. It is believed that Mr. Walker's work is of such a nature that all who are engaged in the future development of the sugar industry will be compelled to use it as their first fundamental reference.

While very much has been done by the publication of this report, the subject of sugar production in the Philippine Islands is one that will require the continued investigation of competent chemists. Negros is at a distance from the central laboratory and consequently, through the aid of Mr. Walker and in conjunction with the Philippine College of Argriculture, the Government has now a small experimental plot for sugar cane at the Los Baños Station. It is the intention carefully to study the soil conditions, the quantity of sugar in the juice and in the cane, the percentage of fiber, the actual results of fertilization, and all other factors upon this plot, so that the gathering of experimental cultural data has been begun. Work of this nature, especially on fertilizers and upon the change in the quality of the cane through various cultural conditions, must necessarily take a number of years because the results can only be gathered from year to year as each crop matures. It would seem fundamental to establish an experiment station in Negros which should be characterized by all varieties of soils and which should be readily accessible.

Our sugar cane at the present time seems to be fortunately situated in respect to diseases. However, experience in other countries has shown that when a cane which has been grown for many years in one locality becomes subject to attack, the ravages are very extensive and unless a reserve of some other variety is at hand, destruction of the entire sugar prospect of the region may result. An experimental farm should provide reserve cane of a number of tried and carefully cultivated species; it should be in a position to ward off a disaster of the kind mentioned above; it should improve the quality of the cane, and above all it should be situated so that the foremen of all of the plantations of the region could come to it for instruction. Indeed, it may be noted that in Java where three such stations exist, the foremen of the various plantations are compelled by law to come to the station for instruction. No doubt an experimental station established on these lines would be of far reaching value. At such a station the chemists of this Bureau would also have opportunities for laboratory work of a more exact nature and of greater importance than they have heretofore been able to do. It is our desire to amplify this work and certainly the importance of it to the people of the Philippines is such that funds should be made available. A study of Mr. Walker's paper will show what can be done by one man with limited means and will certainly point out what could be done by a number of men with greater facilities.

FOOD AND DRUGS LAW.

The percentage of violations of the food and drugs law has been approximately the same as in the first two years of its enforcement, but on the other hand, a gratifying improvement in the quality of the general run of imported foods and drugs has been noted. Compounds of boron sufficient in quantity to be deleterious were found in forty-six samples, benzoic acid in three, sulphurous acid in eleven, salicylic acid in two, and metallic salts in four. While the results of the Bureau have now and then been questioned during the last fiscal year, such criticism has been by no means as frequent as in the past. The Pure Food and Drugs Act has resulted in improving the quality of comestibles imported into the Islands and available to the public.

A large number of samples of opium have been studied in the enforcement of the law against that drug's use; opium was found in twenty-one cases, morphine in seventeen, cocaine in nine. The compounds of the alkaloids, morphine and codeine have been the subject of investigation so as to give us a new and accurate method of distinguishing between these chemical individuals, and the same has been done in working out the determination of phenacetine and acetanilid, antipyrine, and caffeine in the presence of each other.

THE GAS SUPPLY.

Dr. Alvin J. Cox is continuing his study of Philippine coals, but the work was interrupted to a large extent during the year by his absence on leave. Doctor Cox has been associated with the problem of giving us an adequate gas supply and of utilizing Philippine coals for producers. Unfortunately, although the Director during his stay in the United States practically concluded a bargain for the purchase and installation of a producer gas system which would not only give us a supply of water-gas but would feed a 50 horsepower engine, the manufacturers, when it finally came to furnishing a bond to support their guaranty, declined to do so. None of the American manufacturers seemed to be anxious to export their machines excepting on a purely experimental basis on our part, we paying all costs and taking all the risks, with no guaranty whatsoever. The result has been that we have decided to construct in Manila a temporary water-gas plant, utilizing such parts of the small plant at the old Medical School as are available, a tank for scrubbers which has been on the Bureau of Science ground since the erection of the present building and the steam supply from the Bureau of Science. It is believed that without difficulty or great cost we can build an adequate water-gas plant which will give us a gas which, enriched with that from our oil-gas system, will give an ample supply for present purposes at a small cost. We will then be at leisure to take up the question of the purchase in Europe of a producer gas plant for the additional power needed. As the development of producer gas began in Germany it is possible that makers in that country will be willing to guarantee their machines. Meanwhile, power ample to supply the needs of the institutions surrounding the Bureau of Science can be obtained with our present boilers and machinery. However, due regard must be had to the fact that this can not continue indefinitely, as the machines will need to be at times shut down for overhauling and as the call for additional uses of power will make a greater and greater demand upon them. This will be especially true of the two new refrigerating plants when they are started, and the concrete testing machinery and the machinery for ore tests after they are in place will need motors. The subject of obtaining the additional power unit must be kept in mind and taken up as energetically as possible.

THE DIVISION OF MINES.

The rearrangement of the schedule of salaries for this division which was inaugurated in 1909 has enabled the Bureau to fill the staff. There were provided at the time two positions to be utilized for topographers, each at ₱2,000 per annum. However, experience demonstrated that we could not secure competent men and the demand of the mining community for permanency in the assay work and for the establishment of a laboratory for the testing of ores in larger quantities, made it more expedient to combine these two positions and secure a man who would not only be a thoroughly competent assayer, but who would also be capable of carrying on the testing of ores. Mr. Paul R. Fanning joined the staff of the division of mines in the latter part of the fiscal year and has begun to develop the work. Mr. Eddingfield took the position vacated by Mr. Maurice Goodman, so that the division has not suffered from the continued absence of a competent mining engineer. Mr. Wallace E. Pratt came to Manila in October, 1909, and has assisted Doctor Adams in the field work on the geology of central Luzon. Dr. George I. Adams intends to leave the Bureau after he has completed his reconnoissance survey comprising the region in central and southern Luzon from Bulacan on the north to Sorsogon Province on the south. The first part of this work has already been published, and the second portion will be ready for the press before he leaves. Mr. Ferguson went on furlough early in June in order to attend the International Geological Congress in Stockholm. His contact with geologists from all over the world should greatly benefit the division of mines not only by making the work of the Bureau better known to others, but by giving us an opportunity to learn by personal contact what has been going on in geology and mineralogy in recent years. Professor Joseph P. Iddings, of the United States Geological Survey, spent several months in Manila and during this time availed himself of the opportunity which the laboratory gave to him of making petrographic determinations of a large number of our Philippine rocks. This work has been of the greatest advantage in systematizing and classifying our collection, and the paper which has appeared in the Philippine Journal of Science will serve as a basis for all of our future work. The Bureau of Lands, in conjunction with the division of mines, did the triangulation work in the mining region of Paracale-Manbulao, and this step in advance will not only enable miners accurately to locate their claims, but will be the basis of a future topographic map. A topographic map of Taal Volcano was also prepared by the Bureau of Lands and a reduced copy was placed at the disposition of the Bureau of Science for publication.

RECONNOISSANCE WORK.

During the past year the geologic reconnoissance of the Bureau has been extended over southwestern and southeastern Luzon, a part of Leyte, a large portion of Masbate, and over portions of northern Luzon. The mining districts have all been visited by the chief of the division who has thus become acquainted with many of the problems confronting miners. The work in Masbate and the completion of the topographic map of the region has been interrupted to a certain extent by Mr. Ferguson's detail to inspect certain coal deposits in that island and by his journey to Europe to attend the International Geological Congress, but the paper will be completed upon his return. This article should for a number of years to come be practically all we need to do for the important mining region of Masbate. The division has also begun the preparation of relief maps based upon our surveys and of educational models. These were exhibited at the last Philippine Carnival and they aroused a considerable interest on the part of the public. The development of this line of work will be continued. Professor H. Douvillé, of Paris, has undertaken the classification of the foraminifera which had been collected in the Philippine Islands by Dr. W. D. Smith and this marks the beginning of the systematic correlation of Philippine stratigraphy. One of Professor Douvillé's papers is already in the hands of the editor of the Journal and is being prepared for publication.

THE TESTING OF ROAD MATERIALS.

The Bureau has made a great advance during the year in obtaining the machinery for a testing plant for materials used in the construction of roads. Some of this machinery was built on the premises and some, corresponding exactly to that in use in the United States Bureau of Roads, has been purchased in America. Unfortunately, a building is not available as yet to accommodate all this machinery and consequently this work has now to be done in places scattered over the Bureau. Some of the apparatus has been housed under overhanging roofs of the smaller outbuildings. When a structure for testing building material is constructed, all of this machinery can be brought together.

The importance of examining material before a road is constructed is being generally recognized throughout the world and other governments are saving time and money thereby. It often is cheaper to bring road metal from some distance, than to utilize inferior material on the spot, and the testing apparatus gives accurate data as to the resistance to wear of such road material and as to the cementing value of the powder which is formed by abrasion. There can be no doubt but that the installing of facilities for this work, by indicating to engineers just what a given material will be before a road is constructed, will in the end save many times the cost of the machinery and of its operation. Advantage has already been taken of our facilities by the engineers of the city of Manila in a study of the quarries which are now being utilized for furnishing crushed stone. These quarries have been visited and tested by Doctor Adams and new sites have been suggested where, possibly, a better material might be obtained. There is a growing realization of the importance of this class of work among engineers and hence an increasing demand for thorough preliminary tests before work is undertaken either on a new structure or a road.

GENERAL WORK OF THE DIVISION.

The results of interest to the general public obtained during the year by the division of mines have been published, according to custom, in the annual report of the mineral resources of the Islands. This pamphlet is more comprehensive this year than it was in 1909 and a gratifying increase in the production of gold and also a very marked one in that of Philippine coals is recorded therein. The mines on Batan Island are chiefly responsible for the rise in the total production of the latter item. The total value of the mineral products of the Philippine Islands amounted to ₱2,240,047 during the calendar year of 1909. A series of short papers covering the progress of mining in the various mineral districts and special articles on the Geology of the Philippines, on Cyanide Practice in the Philippines, and on Forest Conditions in the Aroroy District, are also included in this publication. The demand for the annual bulletin of mineral resources has been active in the past and the publication of this year should go far toward arousing an interest in the Philippine mines and mining. The division has continued its policy of issuing press bulletins covering recent work of public interest.

The development of the mining districts has been most encouraging, in spite of a disastrous typhoon occurring in the latter part of the year 1909, and which caused considerable damage in the Baguio district. More development work has been done than heretofore, large amounts of ore are being blocked out and in every way the men engaged in the industry have endeavored to show exactly what values are available. The Tayabas oil fields have excited interest during the year, large numbers of claims have been located and one company at least has a well-drilling outfit on the ground. It should be only a matter of a few months before we know whether the extremely encouraging surface indications, which gave us samples of an especially good grade of oil, will be borne out by the discovery of the same oil in large quantities at greater depths.

MINE INSPECTION.

The time is coming nearer each year when the Philippine Islands will need to adopt a system of mine inspection such as is in force in other countries of the world. While as yet the work in mining in the Archipelago may be deemed simply that of development, it is only a question of a few years before our mines will be subject to the same class of serious accidents as have occurred elsewhere. Such accidents can to a great extent be prevented by an adequate system of inspection. A well-trained corps of mine inspectors will involve expense to the Government, but as the mines develop and the sum total of their output increases, it would not be difficult to have the miners themselves bear the expense of the inspection. Government supervision of mining prospectuses involves another question which should receive serious attention while the industry still is young in the Philippines. The question of the revision of the mining laws has been before the authorities a number of times and the matter has been urged upon the Congress of the United States. It is hoped that this need will not be lost sight of, but that the effort to modify our laws so that they will admit of a proper development of our mineral resources, will continue.

The attention of the Philippine Legislature has been called to the necessity of constructing a building for the Bureau of Science which shall be suitable not only for the increased volume of assay work but also for experimental work on larger quantities of ores. This proposed building could also properly have combined with it the space for the physical and chemical testing of concrete and cement. At the present time miners are compelled to send their large samples to the United States for milling and cyaniding tests, thereby being put to considerable expense and much loss of time.

A structure to accommodate all these important branches of work would need to be fairly large, but it should be planned so as to allow for future expansion. The question of obtaining the necessary funds for the undertaking is now before the Secretary of the Interior. Work of this kind, intimately related as it is to the commercial prospects of the Islands, is such that after a short time its results are easily seen by everybody.

THE DIVISION OF ETHNOLOGY.

The Philippine Museum has developed very rapidly in the last year. The repair and alteration of the ground floor of the building was completed during the fiscal year 1909, but the work of installing the cases and placing the exhibits in a proper condition for the public was only completed within the past few weeks. The Bureau of Forestry has shared in the museum undertaking and installed a most satisfactory exhibit of Philippine timbers and forest material. A preliminary attempt has been made to give certain sections of the museum more of a commercial character. Dr. C. B. Robinson of the botanical laboratory has made a careful study of the industry relating to the production of Philippine hats and has installed a representative exhibit covering as many types as it has been possible to secure. Doctor Adams, of the division of mines, has brought together a large number of specimens of Philippine pottery; the chemical laboratory has installed a series of museum jars and bottles demonstrating certain of the natural products of the Archipelago, together with their derivatives. However, this is but a beginning. The consistent development of a commercial exhibit is closely related to the establishment of a section of information.

The type of museum case to be adopted for the future must soon receive serious consideration. The Director of the Bureau, while in Europe and the United States, made a special study of this matter and detailed drawings of the types of cases in use in various museums have been secured, that of the Wistar Institute of Philadelphia appearing to be the best. This institute does not purchase its cases complete from makers, but buys the necessary materials and finishes the cases in its own workshops. In view of the great cost and risk of breakage attendant upon the transportation of finished cases to the Philippines, it is believed that this system should be adopted here and workmen especially trained by us for the purpose should be engaged in the shops of the Bureau of Science. We now have on hand a certain number of wooden cases and the present building can not accommodate more than ten additional units of this type. A new museum building would have sufficient floor space in the individual rooms so that probably one of these would just be filled by the cases on hand and the small number necessary to complete the installation in the present building. Therefore, it seems the best policy to continue the type of wooden cases in the present building and to change to the other one when a new structure is available. The Bureau this year will endeavor to reserve funds for museum cases from the money appropiated for the collection of museum specimens, but it should be remembered that any large number can not be secured in this way.

It is suggested that the Philippine Museum has now grown to such a point that greater attention should be given to it by the authorities. The development of a museum along certain definite lines, with due consideration for the funds available and the logical arrangement of space and cases as well as of material, should be the aim of all who are interested in this important undertaking. A well-equipped museum forms one of the greatest attractions for foreign visitors and should also be one of the fundamental sources of information, not only for inhabitants of the Islands, but for all others.

The labeling of the collection and the cataloguing has been steadily pushed during the year. An exhibit of the kind which we have is of but little value to the public without appropriate labels and of scarcely any value for research unless an adequate and exact catalogue is in existence;

therefore, whenever any of the employees of the division of ethnology have been in Manila, they have been at work on this adjunct of the exhibit. It must be recalled that the collection which formed the nucleus of the present museum came to us in a very disorganized state, without a catalogue and without labels. Therefore, it has been necessary not only to classify the original material, but to take care of rapid accessions which have come to the museum since its establishment. The exhibit comprises several thousands of objects and so it will readily be seen that this work, like that in the library, is no small one. As the catalogue was prepared and the labeling completed, it became necessary to rearrange the collections in a logical manner. This undertaking has been completed for the entire collection representing the northern tribes, and for that from Mindanao. The collection made by Mr. Christie among the Subanuns was arranged before he left for the United States, and that brought in by Mr. Garvan from the Agusan Valley in Mindanao was taken care of as rapidly as he could unpack the material and give the necessary information.

GENERAL WORK OF THE DIVISION.

The following have been the accessions to the museum during 1909:

Number of specimens catalogued at end of 1909	3,508
Number of specimens catalogued at end of 1908	1,732
Showing an increase during the year of	1,776
From this number should be deducted	63
Making a net increase of	1,713

This increase was made up as follows:

From the St. Louis Exposition (not previously catalogued)	953
Obtained by purchase	646
Obtained by gift	113
Obtained by exchange	1
Total	1,713

Mr. Emerson B. Christie went on leave in November, 1909. He spent one semester at Harvard University in ethnologic work, and in making a special study of museum matters. His monograph on the Subanuns of Sindangan Bay appeared early in this calendar year. The knowledge which Mr. Christie has obtained of museum matters, combined with the investigations of the Director of the Bureau, should prove of great value in the final arrangement of the collections.

Mr. H. Ottley Beyer, who formerly was in the Philippine Islands in connection with the Bureau of Education and who returned to the United States in order to make a study of anthropology and ethnology at Harvard University, joined the division of ethnology on January 4, 1910.

As Mr. Beyer had spent a large proportion of this former Philippine service among the Ifugaos of northern Luzon and as he had collected much material for publication from that tribe, it was deemed advisable to have him revisit the scene of his former labors and complete the work already undertaken. While so doing he will make arrangements to ship to the Bureau the collections of material from the mountain tribes which have been made by the various lieutenant-governors by means of funds supplied from the Bureau of Science. Our exhibit should be greatly increased by this visit.

Mr. John M. Garvan was engaged by the division as a temporary employee in July, 1909. From July 19 until March 28, 1910, Mr. Garvan lived in the Agusan Valley, making exploration into regions rarely, if ever, before visited by a white man. As he was thoroughly acquainted with the people by reason of his former experience among them and as he seemed to have the capacity for getting along with them, the results of his explorations have been most valuable. Unfortunately, Mr. Garvan was ill for a part of the time and he lost a certain portion of collection by a serious flood in the Agusan Valley, so that the material which he has brought to the Museum is not so extensive as it might otherwise have been. However, he has prepared a map of the headwaters of the Agusan River which covers a region heretofore mainly mapped by guesswork, and his paper on the subject of the Mandayas should prove of great value.

Doctor Miller in April visited Camiguin Island, lying to the north of Luzon, to investigate certain burial sites which had been found and reported by Captain Mitchell, of the United States Army. Doctor Miller spent six weeks on the island and reports that in several widely separated localities occurred heaps of stones in the center of which were placed earthernware jars. He investigated every portion of the island. Only a few fragments of bones were found in the jars and no evidence could be secured as to what people were buried in these mounds, nor as to the chronologic period in which the custom existed.

The Field Museum of Natural History sent Mr. F. C. Cole back to the Philippine Islands to continue his work among the pagan tribes. He went to Misamis and made a study of the Bukidnon people, after which he returned to Manila and started for Davao, planning to spend several months among the various tribes in that district. Mr. S. C. Simms, also of the Field Museum, came to the Philippine Islands to take charge of the shipping of the collections and notes made by the late Doctor Jones.

The Misses Metcalf have been living in Santa Cruz, Davao, for several years studying the manners and customs of the Bagobos, and making a collection of objects of ethnologic interest. They have returned to Manila and intend soon to depart for the United States.

THE LIBRARY.

Progress has been made steadily in the permanent organization of the library during the year. The classification and shelf list are now approaching completion, with a total of 30,349 volumes. This leaves part of the sections of geology and documents still to be done. It has been decided to use the cards forming the duplicate shelf list as the main cards of the dictionary catalogue. This will save about a year's work, giving a good working catalogue in the course of another year. The new charging system is nearly ready for installation as 25,000 volumes have marked pockets with typewritten charging cards.

One of the greatest needs in the work toward permanent organization is an apprentice class of graduates from the classical course of the Manila High School. The large public libraries in the United States now have these classes. Entrance examinations are required and from half an hour to an hour is devoted to class work daily, with home study assigned. The majority of these apprentices serve two years, either giving their time, or with a compensation not exceeding $20 per month. A provision has been made in the last appropriation bill for four of such graduates, but as yet we have not obtained any candidates. However, at the present time there are two Filipinos engaged in library work in the Islands with the intention of making it their profession.

One thousand seven hundred and thirteen bound volumes were added during the past year, 694 from the bindery of the Bureau of Printing and 1,019 from all other sources. The following list shows some of the more important works and sets of periodicals included in this number:

American Society for Testing Materials, Proceedings, 8 volumes. Congress international de Medicine, 27 volumes. Deutsche pharmazeutische Gesellschaft, Berichte, 18 volumes. The Geographical Journal, 26 volumes. The Journal of Anatomy and Physiology, 44 volumes. Meyer's grosses Konversations lexikon, 21 volumes. Natuurkundig Tijdschrift voor Nederlandch-Indie, 57 volumes. Petermann's Mitteilungen aus Justus Perthes geographische Anstalt, 80 volumes. Pharmaceutische Zentralhalle für Deutschland, 49 volumes. K. Preussische Akademie der Wissenschaften, Berlin, Monatsberichte, 28 volumes; Bericht uber die Bekanntmachung geeigneten Verhandlungen, 4 volumes; Sitzungsberichte, 48 volumes. Tokyo Imperial University College of Science, Journal, 13 volumes.

Classification and cataloguing.—During the year 3,127 bound and 5,811 unbound volumes have been classified and shelf-listed, adding 1,601 cards to the shelf list. The work was seriously interrupted during the months of July and November of last year by vacations and the illness of assistants and during June by the pressure of outside work on the catalogue of photographs.

Work on the catalogue has been started and 4,944 cards are already filed. These cover publications of the Department of Agriculture and the Bleeker fish papers.

Binding.—An effort has been made to bring the binding of unbound serials up to date. During the year 1,284 volumes were prepared for the binder, of which number 694 have been returned. ' Much work still remains to be done in this line.

A card binding list has been completed which will serve for several years. This is used for recording the volumes sent to the bindery and it already has saved much time.

Duplicates.—The duplicate collection has been worked over during the past six months, and items which might prove of value to this Bureau have been listed. Those of a literary or historical nature have been sent to Doctor Robertson, Chief of the Philippine Library, and the remainder dicarded.

Use of the library.—The number of pulications taken out during the year was 3,509. Very little reading has been done in the library owing to its very crowded condition. Because of pressure of current work it has been necessary to use the reading tables for routine work during the greater part of the time. This will have to continue until the library moves into larger quarters, which will be provided by the new wing. The present shelf capacity will accommodate only the volumes now at the bindery, so that the limit predicted in 1902, as being the probable one in ten years, has been reached in eight and one-half. Shelf room is absolutely necessary for the books, and it is hoped that the consulting architect and the Bureau of Public Works will push the addition to the laboratory building with as great rapidity as is possible.

THE PHILIPPINE JOURNAL OF SCIENCE AND OTHER PUBLICATIONS.

The circulation of this Journal has been advanced by creating the position of business manager and assigning the work to Mr. R. C. Redmayne. The subscription list was transferred from the Bureau of Printing to the Bureau of Science and a large amount of advertising done. The result has been that the receipts from subscriptions have increased from ₱1,413.48, covering the period from August, 1908, to July, 1909, inclusive, to ₱3,080.22, covering the period from August, 1909, to July, 1910, inclusive. The number of exchanges is 385. The sale of the other publications has also improved, so that the cash receipts from this source amounted to ₱1,036.62, covering the period from August, 1909, to July, 1910, inclusive. The Bontoc Igorot, by A. E. Jenks, is now out of print, although, when the Bureau took over the division of ethnology, a large number of copies was on hand. Doctor Saleeby's History of Sulu is also very nearly sold out. The question of issuing second editions of these works, which are in great demand, is therefore before us, and although the undertaking would be expensive, it is certain that within three years a decided profit would be shown. Unfortunately, appropriations are so arranged that the entire cost of reissue would fall on one fiscal year, whereas the returns would cover several. The establishment of a reimbursable fund for printing second editions is desirable.

The issue of the Journal was somewhat delayed toward the close of the calendar year 1909 so that the last numbers of Volume IV did not reach the mail until the early part of 1910. The first parts of Volume V therefore also appeared behind time. Number I of the medical section was compelled to wait for the materials gathered from the first biennial meeting of the Far Eastern Association of Tropical Medicine, and as this body did not terminate its discussions until March 14 there was very good reason why this issue was not ready for mailing until July. It is hoped that the regular order can be recovered before the end of 1910.

The volume of work and the variety of the publications appearing in the different parts of the Journal, necessitated the issue of a fourth section, D, on ethnology, anthropology, and general biology; this section began with the calendar year 1910.

The following papers have been printed in the Philippine Journal of Science during the fiscal year; those prepared by the laboratory staff are marked with an asterisk (*), those from the Medical School with a dagger (†):

Section A, Chemical and Geological Sciences and the Industries.—Villaverde, Fr. Juan. The Ifugaos of Quiangan and Vicinity. Translated, edited and illustrated by Dean C. Worcester. With Notes and an Addendum by L. E. Case; †Bean, Robert Bennett. I. Filipino Types: Manila Students. An Attempt to Classify the Littoral Population of Luzon and Adjacent Islands; †Bean, Robert Bennett. II. Filipino Types: Found in Malecon Morgue; *Seale, Alvin. New Species of Philippine Fishes; *Banks, Charles S. Four New Culicidæ from the Philippines; *Banks, Charles S. Rhynchota Palawanica, Part I: Heteroptera; †*Griffin, Lawrence E. A List of Snakes found in Palawan; *Adams, George I. Geological Reconnaissance of the Island of Leyte; †Bean, Robert Bennett. III. Filipino Types: Racial Anatomy in Taytay. (A) The men; †Bean, Robert Bennett. A Cephalograph: The Description of an Instrument for Reproducing the Outlines of the Head and Face; *Brooks, Benjamin T. The Action of Organic Peroxides on the Photographic Plate; *Adams, George I. Tests of Philippine Road Materials; *Adams, George I. Sand, Gravel and Crushed Stone Available for Concrete Construction in Manila; *Ickis, H. M. A Geological Reconnaissance from Infanta, Tayabas, to Tanay, Rizal; *Richmond, George F. Tayabas Petroleum; *Gibbs, H. D. The Compounds which Cause the Red Coloration of Aniline: I. The effect of Oxygen and Ozone and the Influence of Light in the Presence of Oxygen; Hulbert, Clinton H. and *Bacon, Raymond F. A Liquid Concave Mirror; *Holmes, W. C. Distilled Liquors; Whisky (Rye, Bourbon and Scotch), Brandy (Cognac) and Gin; †Vivencio del Rosario, Mariano. On the Determination of Aldehydes in Distilled Liquors; *Gibbs, H. D. and *Agcaoili, F. Lard from Wild and Domestic Philippine Hogs and the Changes in the Constants Produced by Feeding Copra Cake; *Adams, George I. Geological Reconnaissance of Southwestern Luzon; *Reibling, W. C. Concrete Construction in Manila and the Philippine Islands; *Adams, George I. and *Pratt, W. E. Philippine Pottery; Iddings, Joseph P. The Petrography of Some Igneous Rocks of the Philippines; *Freer, Paul C. The Study of Manila Copal; *Foxworthy, F. W. The Almaciga Tree: Agathis Alba (Lam.); *Richmond, George F. Manila Copal; *Brooks, Benjamin T. The Destructive Distillation of Manila Copal; *Brooks, Benjamin T. The Oxidation of Manila Copal by the Air; *Brooks, Benjamin T. The Oleoresins of Pinus Insularis Endl.

Section B, Medical Sciences.—Medical Survey of the Town of Taytay: *Strong, Richard P., I. Introduction; *Adams, George I., II. Geology and Water Supply; *Clegg, Moses T., III. Bacteriological Analyses of the Water Supply; *Richmond, George F. and *Gana, Vicente Q., IV. Chemical Analyses of Taytay Waters; *Merrill, Elmer D., V. The Principal Foods Utilized by the Natives; †Aron, Hans, VI. The Food of the People of Taytay from a Physiological Standpoint; *Banks, Charles S., VII. Mosquitoes and Other Insects; Clements, Paul., VIII. Vital Statistics; Clements, Paul., IX. General Sanitary Conditions; *Garrison, Philip E., †Leynes, Ricardo, and †Llamas, Rosendo., X. Animal Parasites of the Intestine; *Bowman, Fred B., †Lopez, Leoncio, †Manapat, Vicente E. and †Rivera, Vicente., XI. Table of Physical Examinations; †Guerrero, Luis and †Sevilla, Victor., XII. Examinations of the Blood with Special Reference to Malaria; Nichols, Henry J., XIII. Filariasis, Malaria, Tuberculosis, Typhoid Fever, Goitre, Beriberi, Venereal and Skin Diseases; *Garrison, Philip E., XIV. The Disposal of Human Excreta; *Strong, Richard P., XV. Summary and Conclusions.

*Marshall, Harry T. An Unusual Case of Amœbic Dysentery; Heiser, Victor G. and †Calderon, Fernando. Sixth International Congress on Tuberculosis; *Teague, Oscar. The Cutaneous Reaction in Leprosy: Preliminary Report; *Teague, Oscar. The Nastin Treatment in Leprosy; *Ruediger, E. H. Filtration of Immune Serums; *Ohno, Y. K. The Reaction of Culture Media in Relation to the Morphology of the Cholera Organism; *Ruediger, E. H. Immunizing Cattle against Anticattle-Plague Serum; McLaughlin, Allan J. Some Observations upon Cholera in Children; *Ruediger, E. H. Observations on Cattle Plague in the Philippine Islands and the Methods Employed in Combating it; *Coca, Arthur F. and †Gilman, Philip K. The Specific Treatment of Carcinoma; *Clegg, Moses T. The Cultivation of the Leprosy Bacillus;

*Bowman, Fred B. Two Cases of Balantidium Coli Infection, with Autopsy; *Ruediger, E. H. The Difference in Susceptibility to Cattle Plague Encountered Among Cattle and Carabaos; *Whitmore, Eugene R. Tuberculosis in the Philippine Islands; *Freer, Paul C. The Tropical Sunlight; *Strong, Richard P. and *Teague, Oscar. The Treatment of Trypanosomiasis with Especial Reference to Surra; Fraser, Henry, and Stanton, A. T. The Etiology of Beriberi; De Haan, J. On the Etiology of Beriberi; Highet, H. Campbell. Beriberi in Siam; †Aron, Hans. Phosphorus Starvation with Special Reference to Beriberi: I; †Aron, Hans, and †Hocson, Felix. Phosphorus Starvation with Special Reference to Beriberi: II; Shibayama, Gorosaku. Some Observations Concerning Beriberi; Kilbourne E. D. Food Salts in Relation to Beriberi; McLaughlin, Allan J. and †Andrews, Vernon L. Studies on Infant Mortality; McCay, D. The Relationship of Food to Physical Development; Heiser, Victor G. Unsolved Health Problems Peculiar to the Philippines; Neeb, H. M. The Parthenogenesis of the Female Crescent Boby; Shibayama, G. On Malarial Parasites of the Orang-outan; Atkinson, J. M. Malarial Fever During the Puerperium; Castellani, Aldo. Tropical Bronchomycosis. Observations on a New Species of Epidermophyton Found in Tinea Cruris. A New Intestinal Spirillum; Castellani, Aldo and Chalmers, Albert J. Note on an Intestinal Flagellate in Man; Hooton, A. Some Clinical Aspects of Mycetoma, An Unusual Form of Callosity Complicating It; Rogers, Leonard. The Prevention and Treatment of Amœbic Abscess of the Liver; Musgrave, W. E. Intestinal Amœbiasis Without Diarrhœa. A Study of Fifty Fatal Cases; Stitt, E. R. A Quick, Simple, and Accurate Method of Making Differential Blood Counts in Wet Preparations and Its Advantages in the Diagnosis of Surgical and Tropical Diseases; Chamberlain, Weston P. A Statistical Study of Uncinariasis Among White Men in the Philippines; Rissler, R. S. and *Gomez, Liborio. The Prevalence of Intestinal Parasites in Rizal and Cavite Provinces and in Cagayan Valley; Vogel, W. T. de. Myzomyia Rossii as a Malaria Carrier; Dunbar, A. W. Antimalarial Prophylactic Measures and Their Results at the Naval Station, Olongapo, P. I.; *Bowman, Fred B. The Incidence and Complications of Malaria in the Philippine Islands With Special Reference to Its Treatment with Arsenophenylglycin; Brooke, Gilbert E. Notes on Contagious Opthalmia; Perry, Sir Allan. The Present Position of the Leper In View of the Resolutions Passed at the International Conference on Leprosy at Bergen, 1909; †Musgrave, W. E. and †Sison, A. G. Tuberculosis Among Filipinos. A Study of One Thousand Cases of Phthisis; †Musgrave, W. E. and †Sison, A. G. Blood Pressure in the Tropics. A Preliminary Report; Brewer, Isaac W. Tuberculosis in the Philippine Islands; †Musgrave, W. E. and †Sison, A. G. Mali-Mali, A Mimic Psychosis in the Philippine Islands. A Preliminary Report.

Section C. Botany.—Leavitt, Robert Greenleaf. The Genus Eria in the Philippine Islands; *Merrill, E. D. New or Noteworthy Philippine Plants, VII; *Robinson, C. B. A Preliminary Revision of Philippine Myrtaceæ; *Foxworthy, Fred W. Indo-Malayan Woods; Ames, Oakes. Notes on Philippine Orchids With Descriptions of New Species, I.; Beccari, O. Notes on Philippine Palms, II; *Merrill, E. D. A Preliminary Revision of Philippine Combretaceæ; Wainio, E. A. Lichens Insularum Philippinarum, I.; Ames, Oakes. Notes on Philippine Orchids With Descriptions of New Species, II; *Merrill, E. D. Index to Philippine Botanical Literature, V; *Robinson, C. B. Philippine Boraginaceæ; Whitford, H. N. Studies in the Vegetation of the Philippines. I. The Composition and Volume of the Dipterocarp Forests of the Philippines; *Merrill, E. D. An Enumeration of Philippine Leguminosæ, With Keys to the Genera and Species.

Section D, Ethnology, Anthropology, and General Biology.—†Bean, Robert Bennett. III. Filipino Types: Racial Anatomy in Taytay. (B) The Women; †Bean, Robert Bennett. Paleolithic Man in the Philippines. Homo Philippinensis; *Banks, Charles S. Rhynchota Palawanica, Part II.: Homoptera; Distant, W. L. Rhynchota Philippinensia, Part I.; Viehmeyer, H. On the Myrmecophily of Caterpillars of Catochrysops Cnejus Fabr.; Viehmeyer, H. A Myrmecophilus Lycænid Chrysalis from the Philippines; *Banks, Charles S. The Polyscopic Cell.

The cost of distributing the Journal has been greatly lessened by the purchase of addressing machinery complete with stencil cutter, filing cases, frames, etc.

In addition to the publications of the Bureau appearing in the Philippine Journal of Science, there were issued the second volume of McGregor's Manual of Philippine Birds, and the following monographs: The Subanuns of Sindangan Bay, by Emerson B. Christie; A Check List of Philippine Fishes, by Jordan and Richardson; and the Sugar Industry in the Islands of Negros, by Herbert S. Walker.

THE PHILIPPINE CARNIVAL.

The Bureaus of the Government made a special effort this year to give a fairly representative exhibit at the Carnival. The Bureau of Science installed materials representing the pottery industry of the Islands, coals, minerals, vegetable resources, sponges, pearls, and fishes. The silk industry was attractively represented by an installation demonstrating the hatching of the eggs, the care and rearing of the cocoons and the spinning of the silk. The power to drive the spinning machine was furnished by an alcohol motor installed by the Bureau of Internal Revenue. The Bureau also had on exhibition relief maps of the important mineral districts of the Islands, prepared by the division of mines, also section models of coal mines, constructed of timber and cement, and blocks showing the output of gold from year to year.

Samples of petroleum were also shown. The entomologists exhibited live larvæ of mosquitoes and in another jar, the same destroyed by a few drops of petroleum. As many of the staff as could, coöperated with other Bureaus of the Government in giving a course of illustrated lectures. The undertaking of this year was seriously handicapped by lack of special funds. The appropriation for the purchase of museum specimens was utilized as far as possible to cover the exhibit of the Bureau of Science and the Bureau of Forestry. Probably this course for the first year was as good as any which could be adopted. However, with the experience which has been gained, the exhibit can be very much improved in the future and it is hoped that next year, with funds available for the purpose and with a building of greater capacity, this part of the Carnival can not only be made more instructive but also more comprehensive. It is suggested that permanent buildings for exhibition purposes may possibly be secured.

THE ENGINEERING DIVISION.

A number of new installations have been made since the last report was submitted. Two cement and two road material testing machines have been erected outside the assay room. One 28-inch blower and motor, one serum filter of 50 liters capacity and two of 30 liters, and a complete plant of bottle-washing machines have been made and placed in the serum room. The sterilizers in the latter were removed and erected in a new place. One vacuum pump with motor was erected in the distillation room. Other machines which have been made are a sealing wax scraping machine for bottles, a cement rotary kiln, a circular saw, and grinder for the division of mines and a seed-grading apparatus for the Bureau of Agriculture. Cyanide tanks were constructed, sets of standard capacity measure were completed and adjusted. English scales have been converted to the metric system for various Bureaus of the Government and many other repairs and alterations undertaken. A forge shop has also been erected.

Economy.—The expense of running the power plant was practically the same as that of last year, but the fuel cost per horsepower could be materially reduced by using Batan coal or a mixture of this and other soft coal in a proportion which by actual experiments would be found to suit the grates of the boilers. Tests have been made on the properties of mixed fuels to determine this point, and as soon as a regular supply of Batan coal is available in Manila, a modification will be made.

The present electric wiring in the main building is old and not absolutely safe and in wet weather many circuits become grounded causing a loss of power and the heating of conductors. The Bureau of Public Works has been notified of this condition and a change will be made in the defective circuits while the installation for the Philippine General Hospital is being made.

A continuously acting water pump is not economical, and a considerable amount of steam may be saved by building an elevated water tank of sufficient capacity to supply the Bureau of Science, the Medical School, and the General Hospital. However, the engineers of the city of Manila state that, when the new water system is completed, a power pump will no longer be necessary. As the time when this will come about is still indefinite, a tank might be profitable even with due consideration for this improvement. Indeed, I doubt if the supply in the present mains will be sufficient without such a tank. Even after the new mains are completed, a break in them is entirely possible and even probable. An artesian well on the premises would obviate this danger.

The compressed air pump at present in use must be changed to one of another type with a continuously acting motor, in order to avoid the great fluctuations of load on the dynamos. This question becomes more serious as the time for carrying the power for all the buildings on the campus aproaches.

The power plant will soon run continuously and the following personnel has been decided upon: 8 A. M. to 4 P. M.; first assistant engineer, one electrician, one oiler, one fireman, one assistant fireman, two engine roon helpers; 4 P. M. to 12 P. M.; second assistant engineer, one electrician, one oiler, one fireman, one assistant fireman; 12 P. M. to 8 A. M.; third assistant engineer, one oiler, one fireman, one assistant fireman. The average cost per kilowatt hour during the fiscal year was 0.193 centavos.

THE CLERICAL DIVISION.

Mr. G. M. Nell, chief clerk of the Bureau of Science since October 9, 1907, resigned on November 14, 1909, and was succeeded by Mr. R. C. Redmayne. The positions of business manager of the Philippine Journal of Science and of chief clerk have been combined. Five tables showing in detail the routine of the Bureau, its income, appropriation, and expenditures are appended.

THE PHOTOGRAPHER.

Mr. Martin, who is in charge of the photographic work of this Bureau, is on leave of absence. He has been instructed while in Europe to visit certain manufacturers of cinematographic apparatus, and to secure information regarding operation and costs. He is also to visit the works of Zeiss in Jena and Leitz in Wetzlar so as to learn all he can concerning photomigraphic and projection apparatus. The catalogue of the photographs belonging to this Bureau, in preparation by the librarian, is now practically completed. It includes 10,000 negatives. The work performed by the photographer and his assistants appears in the following tables.

PAUL C. FREER,
Director, Bureau of Science.

Table I.—*Comparative table of routine work performed and supplies manufactured and disposed of during the fiscal year 1910, as compared with the fiscal year 1909, by number or quantity.*

[July 1, 1910.]

Division of the Bureau.	Samples or units.		Decrease.	Increase.
	1909	**1910**		
Chemical division:				
Oils, paints, pigments, etc	123	61	62	
Clays, soils, fertilizers, cements	3,076	3,293		217
Fuels, gases, petroleums, woods	8	5	3	
Waters	99	82	17	
Urines, clinical and toxicological analyses etc	436	401	35	
Miscellaneous	462	250	212	
Total	4,204	4,092	112	
Pure-food section:				
Foods, alcohols, beverages, etc. (this item includes all samples received at the laboratory during the year; the special report of the pure-food section includes the number completed)	713	1,020		307
Section of mineral analysis and standardization of weights and measures:				
Assays	423	873		450
Weights and measures standardized	5,021	8,416		3,395
Calorimetric tests of fuels				
Coal tests		8		8
Coal analyses	7	24		17
Rocks and minerals	8	8		
Metals and alloys	3	24		21
Total	5,462	9,353		3,891
Biological laboratory:				
Fæces	7,334	13,910		6,576
Sputum	962	1,945		983
Blood	701	597	104	
Gonococci	14,494	16,944		2,450
Waters	169	343		174
Necropsies	131	378		247
Miscellaneous	3,083	796	2,287	
Total	26,874	34,913		8,039
Serum section of the biological laboratory:				
Vaccine virus (doses)—				
Prepared	2,903,397	3,058,752		155,355
Disposed of	2,841,391	3,154,791		313,400
Antirinderpest serum (cubic centimeters)—				
Prepared	3,678,965	9,610,832		5,931,867
Disposed of	3,652,807	9,485,890		5,833,083
Plague prophylactic (cubic centimeters)—				
Prepared	3,000		3,000	
Disposed of	750		750	
Mallein (doses)—				
Prepared	2,132	1,369	763	
Disposed of	2,320	1,038	1,282	

TABLE I.—*Comparative table of routine work, etc.*—Continued.

Division of the Bureau.	Samples or units.		Decrease.	Increase.
	1909	1910		
Serum section of the biological laboratory—Ctd.				
Diphtheria antitoxin (units)—				
Prepared	119,000	581,000		462,000
Disposed of	223,000	403,000		180,000
Tetanus antitoxin (units)—				
Prepared	220,000	290,000		70,000
Disposed of	77,000	336,500		259,500
Cholera prophylactic (cubic centimeters)—				
Prepared				
Disposed of	4		4	
Antiplague serum (cubic centimeters)—				
Prepared				
Disposed of		30		30
Anticholera serum (cubic centimeters)—				
Prepared	4,789	7	4,782	
Disposed of	331	60	271	
Antidysentery serum (cubic centimeters)—				
Prepared		870		870
Disposed of	270	1,470		1,200
Antityphoid serum (cubic centimeters)—				
Prepared				
Disposed of	180	130	50	
Tuberculin, human (cubic centimeters)—				
Prepared		134		134
Disposed of	109	219		110
Tuberculin, bovine (cubic centimeters)—				
Prepared	37	135		98
Disposed of	56	100		44
Antigonococcus prophylactic (cubic centimeters)—				
Prepared	48	187		139
Disposed of	102	178		76
Antistaphylococcus prophylactic, aureaus and albus (cubic centimeters)—				
Prepared		177		177
Disposed of	20	431		411
Typhoid reagent (for diagnosis) (cubic centimeters)—				
Prepared				
Disposed of		65		65
Normal horse serum (cubic centimeters)—				
Prepared	7,150	18,610		11,460
Disposed of	10,090	24,058		13,968
Normal ox serum (cubic centimeters)—				
Prepared				
Disposed of	2,340	350	1,990	
Normal carabao serum (cubic centimeters)—				
Prepared				
Disposed of	90	660		570
Normal salt solution (liters)—				
Prepared	1,974	548.5	1,425.5	
Disposed of	1,871	652.5	1,218.5	

TABLE I.—*Comparative table of routine work, etc.*—Continued.

Division of the Bureau.	Samples or units.		Decrease.	Increase.
	1909	1910		
Serum section of the biological laboratory—Ctd.				
Cholera vaccine (cubic centimeters)—				
Prepared		68		68
Disposed of				
Dysentery vaccine (cubic centimeters)—				
Prepared		73		73
Disposed of				
Typhoid vaccine (cubic centimeters)—				
Prepared		57		57
Disposed of				
Miscellaneous:				
Shop orders	209	234		25
Photographs	6,786	11,336		4,550
Natural history specimens sold		23		23
Miscellaneous work, etc	11	85		74

TABLE II.—*Comparative table of routine work performed (free and cash) and supplies manufactured and sold during the fiscal year 1910, as compared with the fiscal year 1909, by value.*

[July 1, 1910.]

Division of Bureau.	1909	1910	Decrease.	Increase.
Chemical division:				
Oils, paints, pigments, etc	₱1,116.60	₱588.50	₱528.10	
Clays, soils, fertilizers, cements	15,432.75	5,858.50	9,574.25	
Gases, petroleums, woods, fuels	75.00	51.00	24.00	
Waters	2,725.00	1,465.00	1,260.00	
Urines, clinical and toxicological analyses, etc	1,364.00	1,503.00		₱139.00
Miscellaneous	4,255.00	2,180.75	2,074.25	
Total	24,968.35	11,646.75	13,321.60	
Pure-food section: Foods, alcohols, beverages, etc	10,382.00	15,724.00		5,342.00
Section of mineral analysis and standardization of weights and measures:				
Assays	1,121.00	2,212.75		1,091.75
Weights and measures, standardization	3,084.40	4,338.00		1,253.60
Calorimetric tests of fuels				
Coal analyses	145.00	380.00		235.00
Rock and minerals	116.50	188.00		71.50
Metals and alloys	21.00	161.00		140.00
Miscellaneous				
Total	4,487.90	7,279.75		2,791.85
Biological laboratory:				
Fæces	81,270.00	124,025.00		42,755.00
Sputum	2,884.00	5,934.00		3,050.00
Blood	2,103.00	1,776.00	327.00	
Gonococci	43,482.00	541,365.00		497,883.00
Waters	5,120.00	13,120.00		8,000.00

TABLE II.—*Comparative table of routine work, etc.*—Continued.

Division of Bureau.	1909	1910	Decrease.	Increase.
Biological laboratory—Continued.				
Necropsies	₱3,275.00	₱11,075.00		₱7,800.00
Miscellaneous	10,969.00	3,640.00	₱7,329.00	
Total	149,103.00	700,935.00		551,832.00
Serum section of the biological laboratory:				
Vaccine virus	29,136.30	31,075.85		1,939.55
Antirinderpest serum, bottling, standardizing, etc., only	10,955.43	27,522.85		16,567.42
Mallein	2,220.50	705.00	1,515.50	
Miscellaneous preparation	1,205.35	1,149.85	55.50	
Total	43,517.58	60,453.55		16,935.97
Miscellaneous:				
Shop work exclusive of work done for this Bureau	67.22	115.93		48.71
Photographic work	3,072.98	4,656.71		1,583.73
Natural history specimen sold		23.00		23.00
Miscellaneous work, etc	1,683.30	2,121.69		438.39
Supplies	3,210.27	1,632.59	1,577.68	
Sale of publications (cash only)	1,780.00	3,436.10		1,656.10
Total	9,813.77	11,986.02		2,172.25
Grand total	242,272.60	808,025.07		565,752.47

TABLE III.—*Comparative table of cash receipts for the fiscal year 1910, as compared with the fiscal year 1909.*

[July 1, 1910.]

Division of Bureau.	1909	1910	Decrease.	Increase.
Chemical laboratory:				
Oils, paints, pigments, etc	₱106.50	₱151.50		₱45.00
Clays, soils, fertilizers, cements	3,895.75	4,464.50		568.75
Gases, petroleums, woods, fuels	39.00		₱39.00	
Waters	535.00	265.00	270.00	
Urines, clinical and toxicological analyses, etc	175.00	163.00	12.00	
Miscellaneous	1,120.50	710.75	409.75	
Total	5,871.75	5,754.75	117.00	
Pure-food section: Foods, alcohols, beverages, etc	772.00	1,077.00		305.00
Section of mineral analysis and standardization of weights and measures:				
Assays	930.00	1,748.00		818.00
Weights and measures standardization		10.00		10.00
Calorimetric tests of fuels				
Coal tests		95.00		95.00
Coal analyses	70.00	105.00		35.00
Rocks and minerals	17.50	8.00	9.50	
Metals and alloys		17.50		17.50
Miscellaneous				
Total	1,017.50	1,983.50		966.00

TABLE III.—*Comparative table of cash receipts, etc.*—Continued.

Division of Bureau.	1909	1910	Decrease.	Increase.
Biological laboratory:				
Fæces	₱78.00	₱109.00		₱31.00
Sputum	60.00	42.00	₱18.00	
Blood	48.00	12.00	36.00	
Gonococci	18.00	3.00	15.00	
Waters	205.00	470.00		265.00
Necropsies				
Miscellaneous	105.00	190.00		85.00
Total	514.00	826.00		312.00
Serum section of the biological laboratory:				
Vaccine virus	29,136.30	31,072.85		1,936.55
Antirinderpest serum, bottling, standardizing, etc., only	10,955.43	27,522.85		16,567.42
Mallein	2,220.50	705.00	1,515.50	
Miscellaneous preparations	1,205.35	1,149.85	55.50	
Total	43,517.58	60,450.55		16,932.97
Miscellaneous:				
Shop work	67.22	115.93		48.71
Photographic work	2,513.58	4,260.46		1,746.88
Natural history specimens		23.00		23.00
Miscellaneous work, etc	2,739.80	2,121.69	618.11	
Supplies	3,210.27	1,584.36	1,625.91	
Sale of documents	1,780.00	3,436.10		1,656.10
Refunded, work not done etc. (deducted)	356.45	123.22		233.23
Total	9,954.42	11,418.32		1,463.90
Grand total	61,647.25	81,510.12		19,862.87

TABLE IV.—*Showing free and cash work performed and supplies sold to the various Departments of the Government for the fiscal year 1910.*

Bureau or Department.	Number of samples or units.	Free.	Cash.	Total.
Bureau of Health:				
Foods, alcohols, beverages	631	₱9,016.00		
Fuels, gases, petroleum, woods	1	3.00		
Urines, clinical and toxicological analyses, etc	290	870.00		
Miscellaneous chemical analyses and examinations	7	50.00		
Waters—				
Chemical	38	635.00		
Biological	257	9,620.00		
Fæces	5,645	94,280.00	₱24.00	
Sputum	239	717.00		
Blood	506	1,518.00		
Gonococci	180,455	541,365.00		
Necropsies	430	10,750.00		
Miscellaneous biological work and examinations	775	3,310.00		
Vaccine virus	3,029,130		30,291.30	
Miscellaneous serums and preparations	360,025		382.10	

TABLE IV.—*Showing free and cash work, etc.*—Continued.

Bureau or Department.	Number of samples or units.	Free.	Cash.	Total.
Bureau of Health—Continued.				
Photographic work	617		201.00	
Shop work	1		3.08	
Supplies			37.38	
Miscellaneous work	10		476.71	
Total		₱672,134.00	₱31,415.57	₱703,549.57
Bureau of Agriculture:				
Fertilizers, cements, clays, soils	1	30.00		
Fuels, woods, gases, petroleums				
Foods, alcohols, beverages	16	221.00		
Urines, clinical and toxicological analyses, etc				
Miscellaneous chemical work and examinations	1	15.00		
Waters, biological	1	40.00		
Miscellaneous biological work and examinations	5	17.00		
Artirinderpest serum (bottling, sterilizing, etc.) only	9,455,453		26,846.41	
Mallein	150		15.00	
Miscellaneous serums and preparations			4.00	
Photographic work	554		415.60	
Supplies			207.22	
Miscellaneous work	1		1.92	
Total		323.00	27,490.15	27,813.15
Bureau of Supply:				
Oils, paints, pigments, etc	18	185.00		
Fertilizers, cements, clays, soils	122		144.00	
Gases, petroleums, woods, fuels	3	34.00		
Metals and alloys	2	7.00		
Foods, alcohols, beverages	2	11.00		
Standardizations of weights and measures		1,248.20		
Miscellaneous chemical work and examinations	2	30.00		
Waters, biological	8	320.00		
Miscellaneous biological work and examinations				
Supplies				
Total		1,835.20	144.00	1,979.20
Bureau of Public Works:				
Oils, paints, pigments, etc	5	23.50		
Fertilizers, cements, clays, soils	2,717	351.00	2,662.00	
Miscellaneous chemical work and examinations	47	107.00		
Metals and alloys	3	35.00		
Waters—				
Chemical	31	465.00		
Biological	40	1,600.00		
Miscellaneous work	6		51.00	
Photographic work	33		71.20	
Supplies			65.85	
Total		2,581.50	2,850.05	5,431.55

TABLE IV.—*Showing free and cash work, etc.*—Continued.

Bureau or Department.	Number of samples or units.	Free.	Cash.	Total.
Bureau of Prisons:				
Oils, paints, pigments, etc	1	₱5.00		
Fertilizers, cements, clays, soils	3	75.00		
Standardization of weights and measures				
Urines, clinical and toxicological analyses, etc	25	85.00		
Waters, biological	1	40.00		
Fæces	8,303	29,624.00		
Sputum	1,464	5,155.00		
Blood	79	285.00		
Necropsies	14	150.00		
Miscellaneous biological work and examinations	6	60.00		
Total		35,479.00		₱35,479.00
Bureau of Internal Revenue:				
Foods, alcohols, beverages	128	4,540.00		
Standardization of weights and measures	1	0.50		
Miscellaneous chemical work and examinations	50	300.00		
Total		4,840.50		4,840.50
Bureau of Printing:				
Miscellaneous chemical work and examinations	78	780.00		
Assays	2	6.00		
Total		786.00		786.00
Bureau of Customs:				
Oils, paints, pigments, etc	7	70.00		
Foods, alcohols, beverages	125	790.00		
Standardization of weights and measures	1	8.00		
Metals and alloys	16	325.00		
Miscellaneous chemical work and examinations	29	188.50		
Waters, biological	1	40.00		
Total		1,421.50		1,421.50
Bureau of Science:				
Oils, paints, pigments, etc	5	62.00		
Fertilizers, cements, clays, soils	26	223.00		
Fuels, woods, gases, petroleums				
Foods, alcohols, beverages				
Metals and alloys	1	3.00		
Urines, clinical and toxicological analyses, etc	42	385.00		
Rocks and minerals	6	180.00		
Coal test	2	30.00		
Coal analyses	17	275.00		
Assays	212	458.00		
Miscellaneous chemical work and analyses	1	3.50		
Waters, biological	13	520.00		

TABLE IV.—*Showing free and cash work, etc.*—Continued.

Bureau or Department.	Number of samples or units.	Free.	Cash.	Total.
Bureau of Science—Continued.				
Photographic work	764	₱342.45		
Shopwork	206	3,437.30		
Miscellaneous				
Total		5,919.25		₱5,919.25
Bureau of Justice: Miscellaneous chemical work and examinations	3		₱30.00	30.00
Bureau of Forestry:				
Oils, paints, pigments, etc	1	5.00		
Photographic work	307		257.30	
Total		5.00	257.30	262.30
City of Manila:				
Fertilizers, clays, cements, soils	27		54.00	
Foods, alcohols, beverages	1		10.00	
Miscellaneous serums and preparations	82,250		78.25	
Mallein	19		19.00	
Photographic work	45		17.70	
Miscellaneous biological	1		75.00	
Total			253.95	253.95
Provinces and municipalities:				
Waters—				
Chemical	3		45.00	
Biological	2		80.00	
Vaccine virus	3,600		108.00	
Miscellaneous work	1		107.41	
Total			340.41	340.41
Public Health and Marine-Hospital Service:				
Fertilizers, cements, clays, soils	2	30.00		
Vaccine virus	2,000		20.00	
Miscellaneous work	1		6.00	
Total		30.00	26.00	56.00
Executive Bureau: Photographic work	3		2.40	2.40
Bureau of Lands:				
Fertilizers, cements, clays, soils	16	465.00		
Foods, alcohols, and beverages	3	12.00		
Photographic work	288		55.60	
Total		477.00	55.60	532.60
Philippine Medical School:				
Miscellaneous chemical work and examinations	2	10.00		
Miscellaneous serums	134		23.70	
Photographic work	489		162.20	
Shopwork	3		7.68	
Miscellaneous work	5		889.96	
Supplies			7.23	
Total		10.00	1,090.77	1,100.77

TABLE IV.—*Showing free and cash work, etc.*—Continued.

Bureau or Department.	Number of samples or units.	Free.	Cash.	Total.
United States Army and Navy:				
Oils, paints, pigments, etc	1		₱10.00	
Fertilizers, cements, clays, soils	162		616.00	
Coal analyses	2		30.00	
Foods, alcohols, beverages	30		396.00	
Miscellaneous chemical	1		5.00	
Waters—				
Chemical	6		125.00	
Biological	5		200.00	
Vaccine virus	13,730		548.10	
Mallein	671		671.00	
Miscellaneous biological	1		75.00	
Miscellaneous serums and preparations	147,422		244.40	
Photographic work				
Miscellaneous work	2		50.00	
Supplies			22.91	
Total			2,993.41	₱2,993.41
Bureau of Education:				
Fertilizers, cements, clays, soils	14	₱185.00		
Miscellaneous chemical work and examinations	1	5.00		
Waters, biological	1	40.00		
Photographic work	894		352.42	
Supplies			24.97	
Total		230.00	377.39	607.39
Bureau of Constabulary:				
Miscellaneous chemical work and examinations	9	80.00		
Fæces	6	18.00		
Sputum	5	15.00		
Miscellaneous biological work and examinations	1	75.00		
Vaccine virus	1,300		13.00	
Supplies			10.00	
Total		188.00	23.00	211.00
Bureau of Navigation:				
Oils, paints, pigments, etc	7	70.00		
Fertilizers, cements, clays, soils	75	40.00	110.00	
Foods, alcohols, beverages	1	15.00		
Miscellaneous chemical work and examinations	2	10.00		
Waters, biological	1	40.00		
Total		175.00	110.00	285.00

TABLE IV.—*Showing free and cash work, etc.*—Continued.

Bureau or Department.	Number of samples or units.	Free.	Cash.	Total.
Philippine College of Agriculture: Securing and shipping seed of sugar cane			₱177.25	₱177.25
Coast and Geodetic Survey: Photographic work	6		1.20	1.20
Miscellaneous:				
Oils, paints, pigments, etc	16		141.50	
Fertilizers, cements, clays, soils	16		1,187.50	
Fuels, woods, gases, petroleums	2		14.00	
Foods, alcohols, beverages	89		666.00	
Urines, clinical and toxicological analyses	51		154.00	
Rocks and minerals	2		8.00	
Coal test	6		95.00	
Coal analyses	5		75.00	
Assays	697		1,748.75	
Standardization of weights and measures	2		10.00	
Miscellaneous chemical work and examinations	11		553.75	
Waters—				
Chemical	3		80.00	
Biological	12	₱80.00	190.00	
Fæces	17		73.00	
Sputum	14		42.00	
Blood	4		12.00	
Gonococci	1		3.00	
Miscellaneous biological work and examinations	3		15.00	
Vaccine virus	2,384		124.20	
Miscellaneous serums and preparations	116,133		381.00	
Photographic work	7,204		2,719.41	
Shopwork	9		99.60	
Miscellaneous work, etc	138		747.02	
Supplies			1,229.26	
Sale of publications			3,436.10	
Natural history specimens	101		189.80	
Refunds, work not done, etc. (deductions)			123.22	
Total		80.00	13,871.67	13,951.67
Grand total		726,514.95	81,510.12	808,025.07

NOTE.—The value of free work is based on the rates as given in the official schedule of charges approved by the honorable the Secretary of the Interior, and does not comprise amounts based on wholesale rates; this in accordance with Act 807, section 1, Bureau of Government Laboratories, last paragraph, July 1, 1909.

TABLE V.—*Comparative statement showing expenditures (including obligations incurred) for the fiscal year 1910 as compared with the fiscal year 1909.*

[July 1, 1910.]

Item.	Expended during the year.	Outstanding obligations on July 1, 1910, incurred during the fiscal year.	Total for the fiscal year 1910.	Total for the fiscal year 1909.	Decrease.	Increase.
Apparatus, supplies, etc.:						
Miscellaneous supplies and chemicals	₱13,115.68	₱7,016.18	₱20,131.86	₱19,782.74	----------	₱349.12
Apparatus	7,885.67	6,577.86	14,463.53	12,415.26	----------	2,048.27
Supplies for power plant, oil, coal, etc	11,736.62	158.19	11,894.81	8,907.66	----------	2,987.15
Small animals, feed, etc	1,891.42	6.00	1,897.42	4,757.94	₱2,860.52	----------
Large animals, feed etc	6,822.91	----------	6,822.91	6,708.41	----------	114.50
Office supplies	2,612.61	62.30	2,674.91	2,539.48	----------	135.43
Photographic supplies	2,686.12	330.00	3,016.12	3,122.53	106.41	----------
Books, subscription, etc	439.89	1,901.00	2,340.89	7,763.03	5,422.14	----------
Total	47,190.92	16,051.53	63,242.45	65,997.05	2,754.60	----------
Transportation and freight:						
Transportation, travel expenses, per diems, launch hire, etc	10,824.66	1,045.85	11,870.51	11,610.40	----------	260.11
Freight	567.26	32.86	600.12	589.90	----------	10.22
City transportation	3,224.62	----------	3,224.62	5,403.35	2,178.73	----------
Total	14,616.54	1,078.71	15,695.25	17,603.65	1,908.40	----------
Miscellaneous:						
Telephones and fire-alarm boxes	739.20	----------	739.20	696.00	----------	43.20
Postage, telegrams, cablegrams	3,088.95	----------	3,088.95	2,492.88	----------	596.07
Repairs to apparatus, furniture, etc	983.95	----------	983.95	602.26	----------	381.69
Laundry	599.91	----------	599.91	409.99	----------	189.92
Printing and binding	16,591.13	14,487.60	31,078.73	22,450.16	----------	8,628.57
Advertising	3,194.45	----------	3,194.45	750.00	----------	2,444.45
Incidentals, building maintenance, etc	2,599.60	----------	2,599.60	4,593.29	1,993.69	----------
Museum specimens	6,694.12	1,159.75	7,853.87	----------	----------	[a]7,853.87
Total	34,491.31	15,647.35	50,138.66	31,994.58	----------	18,144.08

---

[a] Museum specimens purchased in previous years included in Miscellaneous supplies and chemicals.

TABLE V.—*Comparative statement showing expenditures, etc.*—Continued.

Item.	Expended during the year.	Outstanding obligations on July 1,1910, incurred during the fiscal year.	Total for the fiscal year 1910.	Total for the fiscal year 1909.	Decrease.	Increase.
Salaries and wages:						
Salaries and wages	₱245,960.35	----------	₱245,960.35	₱233,056.90	----------	₱12,903.45
Transportation en route foreign country to Manila and expenses	5,492.39	₱631.00	6,123.39	2,157.50	----------	3,965.89
Accrued leave and half salary	21,484.97	208.33	21,693.30	15,799.07	----------	5,894.23
Total	272,937.71	839.33	273,777.04	251,013.47	----------	22,763.57
Grand total	369,236.48	33,616.92	402,853.40	366,608.75	----------	36,241.65
The outstanding obligations of previous fiscal years unpaid on July 1, 1909, amounted to ₱41,147.73. During the fiscal year 1910 ₱37,920 44 was paid against this amount and the difference between estimates and actual costs and cancellations amounted to ₱1,069.33, leaving the obligations still due on previous fiscal years ₱2,157.96	37,920.44	2,157.96				
	407,156.92	35,774.88				
Transferred to other Bureaus:						
Bureau of Agriculture	27,324.34					
Bureau of Public Works	10,237.56					
Expenses incurred in sending employees to Baguio during heated season, fiscal year 1910	3,442.48					
	448,161.30	35,774.88				

Appropriation account:		
Appropriated, Act 1955		327,000.00
Restoration of reverted balance		27,324.34
Cash receipts		77,159.16
Accounts receivable June 30, 1910		8,148.15
Transferred from other Bureaus:		
Bureau of Health		3,156.80
Bureau of Public Works		3,529.41
Balance from previous years, brought forward to cover outstanding obligations		41,147.73
Total		487,465.59
Expended, as shown above ₱407,156.92 plus outstanding obligations, ₱35,774.88, and Baguio expenditures, ₱3,442.48	₱446,374.28	
Transferred to other Bureaus	37,561.90	483,936.18
Reversion, fiscal year 1910		3,529.41
Library fund balance (No expenditures, fiscal year 1910.)		2,909.00
Fund for scientific investigation of animal diseases:		
Appropriated, Act 1955		10,000.00
Expended		5,918.67
Balance		4,081.33

TABLE VI.—*Summary of samples examined for violation of the Food Law.*

Kind.	No. of samples.	Illegal.	Kind.	No. of samples.	Illegal.
Fresh meats	7	0	Flavoring extracts	3	2
Salted, pickled, and smoked meats	22	4	Edible oils	21	13
Manufactured, miscellaneous meats	29	14	Coffee, tea, chocolate	14	1
Fish, miscellaneous	154	90	Nonalcoholic beverages	41	18
Milks	67	29	Wines	30	9
Butter	23	10	Distilled liquors	7	4
Imitation butter	4	3	Vinegar	3	3
Cheese	23	3	Salt	2	0
Flour, etc	11	5	Opium, morphine, cocaine, cases	56	47
Fruits, dried, canned, preserved	21	8	Miscellaneous poison cases	6	1
Canned vegetables	62	28	U. S. Pharmacopocal preparations	4	2
Miscellaneous vegetable products	8	3	Proprietary medicine	92	47
Saccharine products	4	1	Miscellaneous	3	0
Condiments	7	1	Total	724	346

INDEX.

Acetanilid, determination of, 40.
Alcohol, 37.
Animal parasites, 15.
Antipyrine, determination of, 40.
Aquarium, 8.
Arsenophenylglycin, use of, in treatment of surra, 10.
Bass, black, 28.
Benzoic acid in foods and drugs, 39.
Biological Laboratory, 9; changes in staff of, 9; lack of pathologists in, 10; investigations by, 10; routine work of, 16; serum section of, 16; entomologic section of, 23; section of fisheries of, 27; section for the collection of natural history specimens of, 30.
Boron in foods and drugs, 39.
Botanical section, routine work of, 17; economic work of, 18.
Botanical exploration, 20.
Botanic garden, 22.
Botany, systematic, 19.
Bureau of Science, history of, 3; increased appropriations for, 4; growth of, 5; income of, 5; value of scientific work of, 6; need of additional funds, 7; salaries of employees of, 7; new wing of, building, 7.
Caffeine, determination of, 40.
Carcinoma, vaccine against, 12; summary of study on, 12.
Carnival, Philippine, 53.
Cement, 36.
Chemical laboratory, 32; changes in staff of, 32; routine work of, 33.
Cholera, study of, 13; effect of estero protozoa upon virulence of, 14; production of, toxin, 14; treatment of, 15.
Clerical division, 55.
Cocaine, determination of, 40.
Codeine, determination of, 40.
Economic work of botanical section, 18.
Engineering division, 54.
Entomologic section, 23; routine work, 23; additions to collection of, 23; silk culture, 24; mosquitoes, 27.
Entomology, systematic, 24.
Ethnology, division of, 44; museum cases of, 46.
Far Eastern Association of Tropical Medicine, 8; first biennial meeting of, 8; delegates to first meeting of, 8; sessions of, 8; benefits of, 9; next meeting of, 9; session of, at Baguio, 9.
Fisheries, section of, 27; sponges and pearls, 27; condition of work in, 29.
Food and drugs law, 39.
Foraminifera, classification of Philippine, 42.
Gas supply, 40.
General Hospital, completion of, 7.
Grading and filling of grounds, 7.
Herbarium, the, 20; specimens added to, during the year, 20; exchanges, 21.
Hookworm, in Las Piñas, 16; in Cagayan Valley, 16; in Baguio, 16.
Hydrophobia, studies relating to, 11; in the Philippines, 11; strain of, virus from Saigon, 11; virus of, from Japan, 12.
Importation of plants, control of promiscuous, 19.
Investigation, of suspected red rot in Negros sugar cane, 18; of rubber plants, 18.
Leprosy, isolation of, organism, 13; treatment of, with Nastin, 13.
Library, expenditures for, 4; classes of books lacking in, 5.
Library, 48; important sets added to, 48; classification and cataloging of, 48; binding, 49; duplicate publications, 49; use of, 49.
Marine products, general, 28.
Medical School, completion of building of, 5.
Metallic salts in foods and drugs, 40.
Mine inspection, 44.
Mines, division of, 41; change in staff, 41; reconnaissance work, 42; testing of road materials, 42; general work of, 43.
Morphine, determination of, 40.
Mosquitoes, experiments on, 27.
Museum Building, condition, 7; size, 7; proposed sale of, 8; proposed new, 8.
Museum, Philippine General, value of, 8; outline of work for, 8.
Mycologist, necessity for, 19.
Natural history specimens, section for the collection of, 30; sale of specimens, 31.
Opium, determination of, 40.
Oxalic acid, work on sensitiveness of, 36.
Parasites, animal, 15; examination of Bilibid prisoners for, 15; in inhabitants of Las Piñas, 16; in inhabitants of Cagayan Valley, 16; in Igorot children, 16.
Phenacetine, determination of, 40.
Philippine Carnival, 53.
Philippine Journal of Science, 49.
Photographer, 55.
Photographic collection, catalogue of, 5.

Publications of the Bureau, 49; 53.
Reconnaissance work of division of mines, 42.
Red rot, suspected outbreak of, in Negros, 18.
Road materials, testing of, 42.
Routine work, biological laboratory, 16; of botanical section, 17.
Rubber plants, investigation of, 18.
Salicylic acid in foods and drugs, 39.
Serum section, 16; investigations by, 17.
Silk culture, 24.
Sugar laboratory, Iloilo, 37.
Sulphurous acid in foods and drugs, 39.
Sunlight, tropical, 36.
Surra, study and cure of, 10.
Systematic botany, 19.
Systematic entomology, 24.
Tables, comparative, of routine work of the bureau, 56.
Trypanosomiasis, study and cure of, 10.
Uranyl acetate, work on sensitiveness of, 36.
Vibrios of cholera, 14.
Vibrios other than cholera, 14.
Zoölogy, work in general, 31.

○

[illegible] ARY

[illegible] 25 [illegible]

UNIVERSITY OF MICHIGAN
3 9015 04878 4451

BOOK CARD

Q
183
.P55

AUTHOR Phillipine Bur. of Science

TITLE Reports V. 5-11,

1906-12

SIGNATURE	ISS'D	RET'D

Form 176(8-22-21)30M

PHILIPPINE
BUREAU
OF
SCIENCE

REPORTS

5-11
1906-12

Q
183
.P55

UNIV.
OF
MICH.